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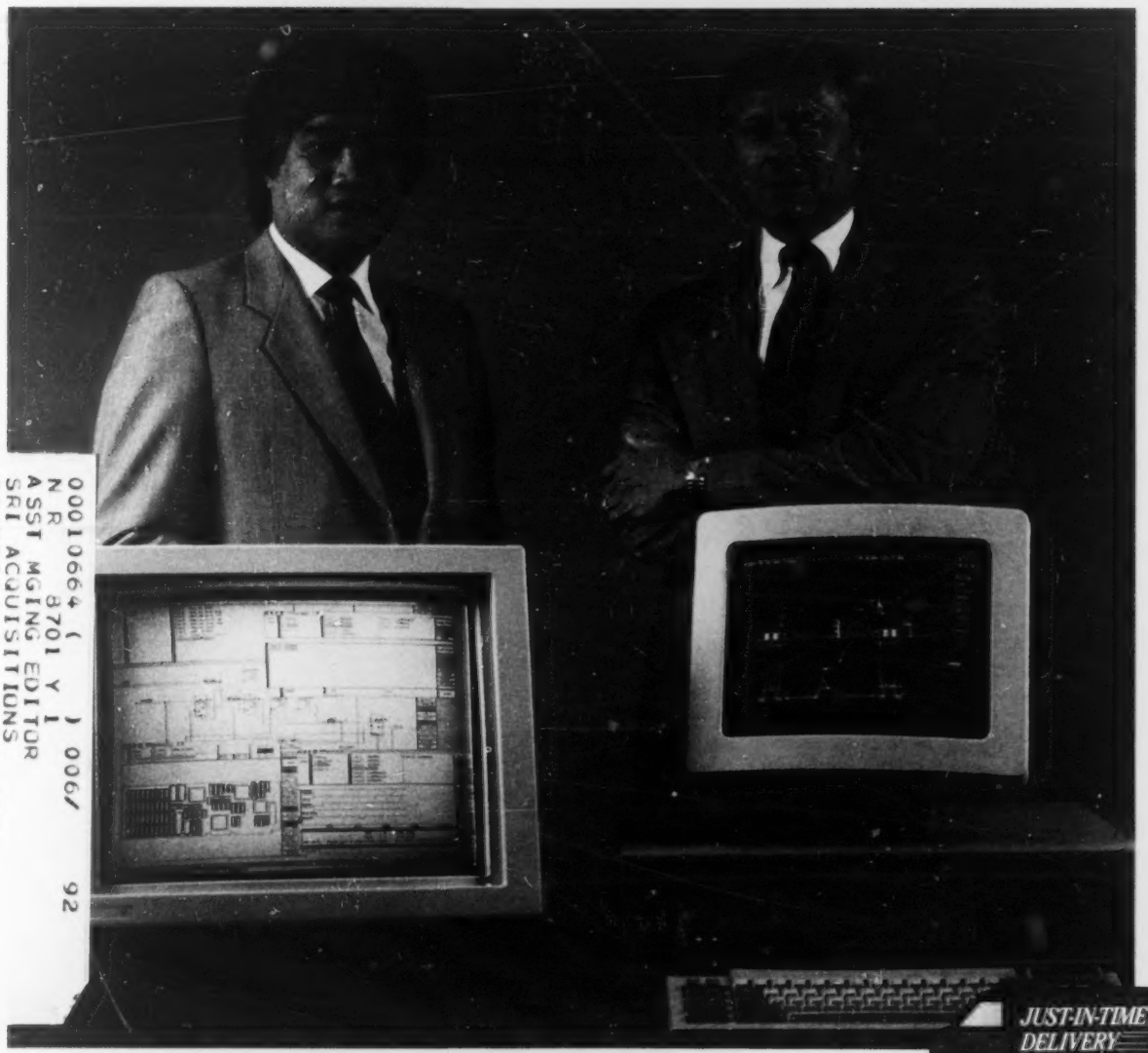
Electronic Business

Japan at the crossroads: A new chance for U.S. high tech

In search of ISDN, the Integrated Services Digital Network



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Bernard Tse and Phillip White: A couple of Wyse guys make good in terminals

Electronics Factory of the Future

Electronic Business

VOL. 12, NO. 21 NOVEMBER 1, 1986

THE BUSINESS MAGAZINE FOR THE ELECTRONICS INDUSTRY

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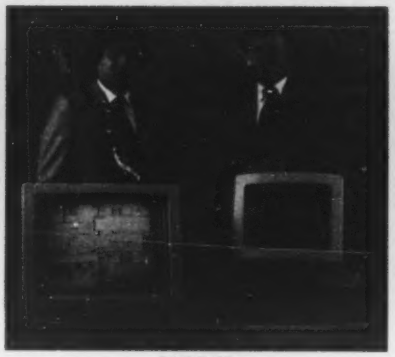

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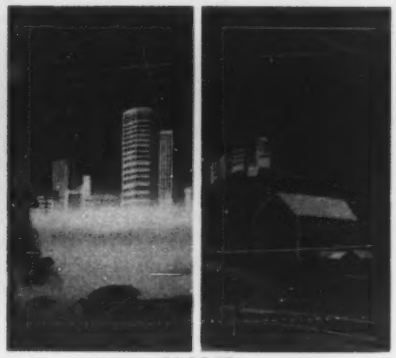

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Cover photo: Robert Isaacs

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BPA ABP

Industrial distribution sales grow, but not from chips

Growth comes from computers, connectors, instruments. Low EPROM prices don't help

"AMD's accounting policy recognizes [shipments to industrial distributors] as sales only after the distributor resells the products." So wrote Advanced Micro Devices Inc. chairman W.J. Sanders III, in the company's report for the second calendar quarter of 1986, to explain why AMD's sales did not keep pace with the recovery that began (for his company) in the autumn of 1985. "Much of the product [we] shipped to distributors in June remained on their shelves," explained Sanders. He and his distributors had expected better. "Based upon the strength of orders placed with us by distributors, we had anticipated a significant increase," laments Sanders in his report.

Other semiconductor manufacturers have seen the same problem in distribution sales that affected AMD. According to the Semiconductor Industry Association (SIA), sales to U.S. distributors peaked last April at 28% but have been declining since, both in dollar volume and as a percentage of sales by chip makers to the U.S. market. Distributors are, as Sanders points out, overstocked with semiconductors. To trim their inventories, they have cut orders for semiconductors so much that they dragged the SIA's book-to-bill ratio below unity last July.

On the other hand, distributors did better with products other than with semiconductors. According to the National Electronic Distributors Association (NEDA), shipments by U.S. industrial electronics distributors last June reached the highest level since September 1984. NEDA's estimate is based on a sample of companies which includes six of the top 10 distributors and represents almost half of the total dollar sales. But they have trimmed orders for chips because their own books have been filling more slowly since March.

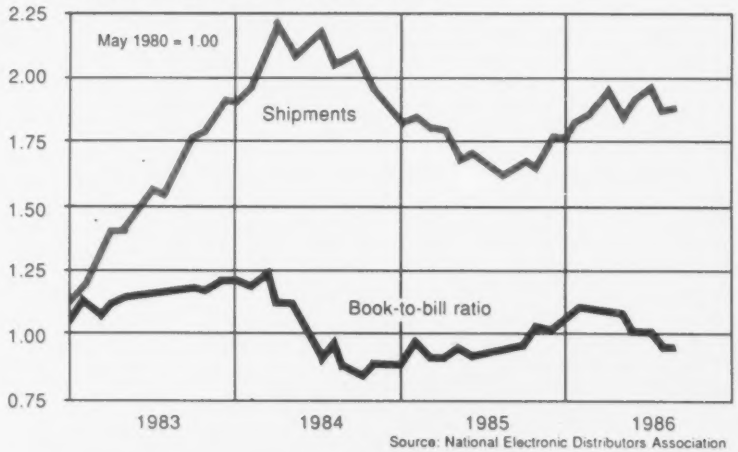
Although there are few bright spots in distribution, it continues to grow. The NEDA index for shipments shows that distributors' sales in the first half of this year were 13% higher than sales for the same period last year and lagged by only 10% from the record first half of 1984.

Part of the activity comes from connectors, as chairman Tony Hamilton of the No. 1 distributor, the Electronic Marketing Group of Avnet Inc., pointed out last month in his keynote speech at the Connectors and Interconnection Technology symposium — the major annual forum organized by connector users. The activity in military electronics and in avionics has created a steady (military and commercial) demand this year for high-quality connectors and interconnection components which command high prices and provide high margins. Between its two major distributors, Hamilton/Avnet and Time Electronics, Avnet's EMG will ring up almost half billion dollars this year in sales.

Another distribution item that is still small but whose growth has helped distributors' shipments this year is electronic instruments. NEDA estimates that distributors which specialize in this area sold $140 million worth of electronic test and measurement equipment in 1985.

ALBERTO SOCOLOVSKY

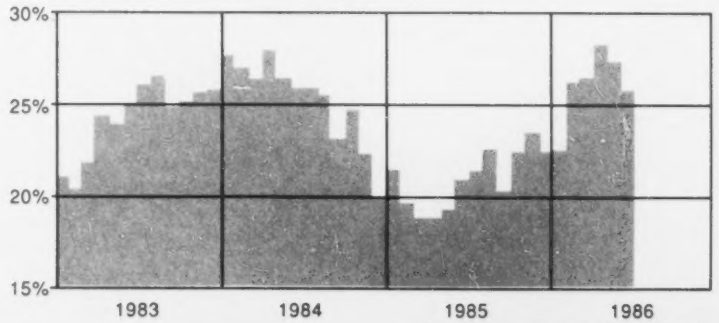
Distribution business index



Source: National Electronic Distributors Association

Distributors' share of IC shipments

(Percentage of U.S./Canadian shipments)



Source: Semiconductor Industry Association

Slower growth expected

The United States Index of Industrial Production, a coincident indicator of the U.S. economy, was up a slight 1.1% annualized rate in the first quarter of this year. Mild declines are expected in the second and third quarters, with a turnaround starting in the fourth quarter. For the year, production is expected to be up a scant 0.3% from last year.

The Cahners Early Warning Indicator (CEWI) is a weighted average of housing starts, the Dow Jones Industrial Stock Index and the money supply (M2) — deflated by the Consumer Price Index. It forecasts probable business cycles about 12 months in advance. The black curve is a plot of the 12-month rate of change Index of Industrial Production. That is, its change over a 12-month period can be determined by comparison with the line at 100. For example, the 100.3 level forecasts using the CEWI for the end of this year indicates that the average for all of 1986 should be 0.3% above 1985.

Readers can obtain a brochure explaining the CEWI method from Cheryl Patstone, economist, Cahners Economics Department, 3021 Tisch Way, Suite 100, San Jose, Calif., 95128.

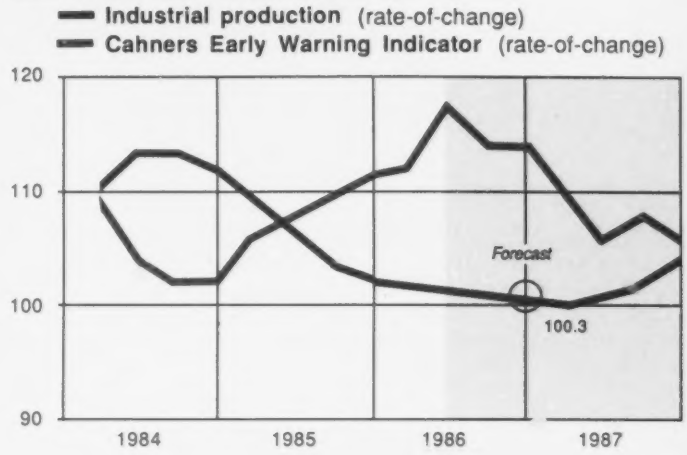
Electronic components

Component manufacturers scaled back production steadily in the second quarter. As a result, output at midyear stood at the lowest level in nearly three years and was off more than 20% from the peak rate in the summer of 1984. On a brighter note, the margin of year-to-year loss has narrowed steadily over the course of 1986, suggesting that better times are ahead. If orders show their traditional seasonal improvement in the fourth quarter, then production activity is likely to show a corresponding upswing toward year's end. We expect an overall 7.8% real decline in output for 1986, followed by gains of 10.8% next year and about 23.8% in 1988.

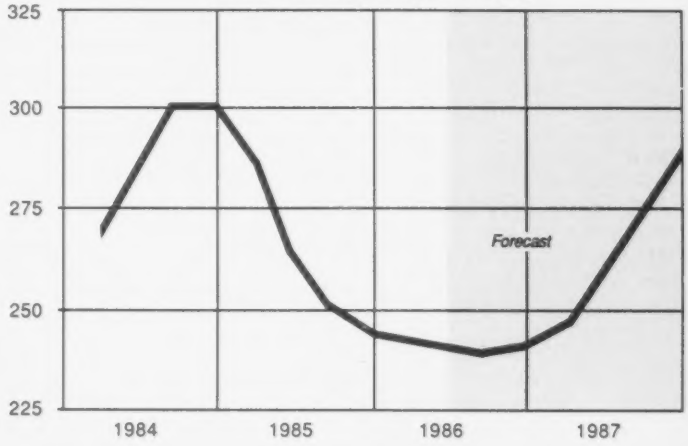
Equipment, instruments and parts

Instrument production slackened in June, but the entire second quarter still showed an increase of about 1% over the first quarter pace. This year's declines in U.S. capital investment have weighed down many segments of the industry, such as scientific and engineering instruments and factory automation. But medical and consumer products have been unaffected by the drop in investment spending and have helped to prop up the industry. Production will continue to inch upward, over the balance of this year, achieving an annual gain of 2.9%. Look for a rebound in the capital equipment markets to bring subsequent increases of 3.2% in 1987 and 9.8% in 1988.

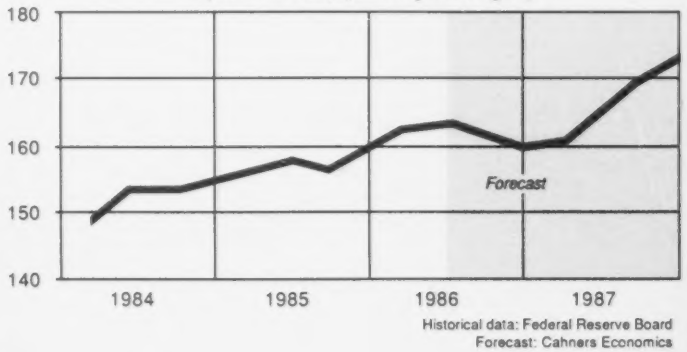
Economic indicators



Industrial production: Electronic components
(1977 = 100, quarterly averages)



Industrial production: Equipment, instruments and parts
(1977 = 100, quarterly averages)



Historical data: Federal Reserve Board
Forecast: Cahners Economics

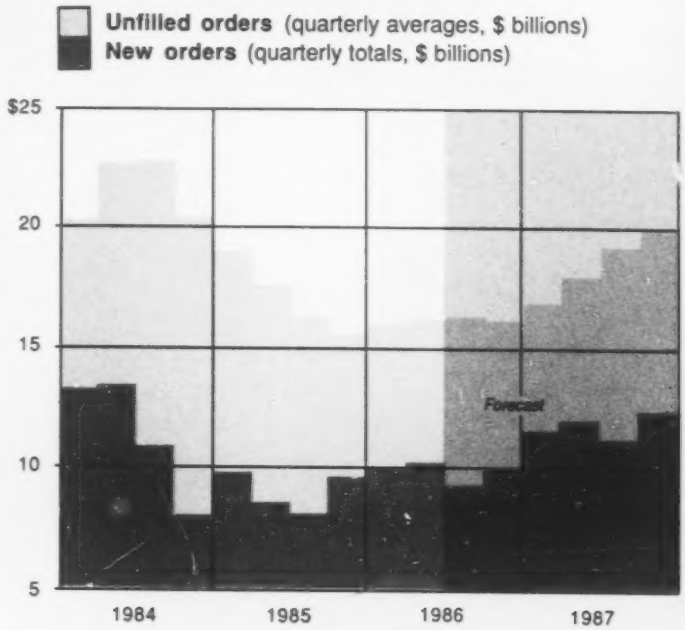
New orders
Component manufacturers received $10.17 billion worth of orders in this year's second quarter, an increase of 3.0% over the total for the prior three months and up 20.1% compared to the second quarter of 1985. But the industry's strength faded toward midyear when economic growth slowed to a crawl, causing order rates to fall back more than usual in the seasonally sluggish third quarter. Demand is expected to begin improving again toward year's end, with a gradual uptrend over the course of 1987. After falling 20.7% in 1985, orders are forecasted to increase 9.4% to $39.3 billion this year, 19.0% next year, and 23.2% more in 1988.

Unfilled orders
Manufacturers' order backlogs averaged $16.1 billion in the second quarter. This represents a slight increase over the first quarter but a decrease of more than 8% from the second quarter of 1985. A midyear drop-off in component demand will prevent backlogs from increasing over the next several months. However, they should begin to expand again by early 1987, finishing next year more than 20% ahead of the late 1986 level. Unfilled orders are expected to decrease 5.7% this year, followed by gains of 14.2% and 28.1% in 1987 and 1988, respectively.

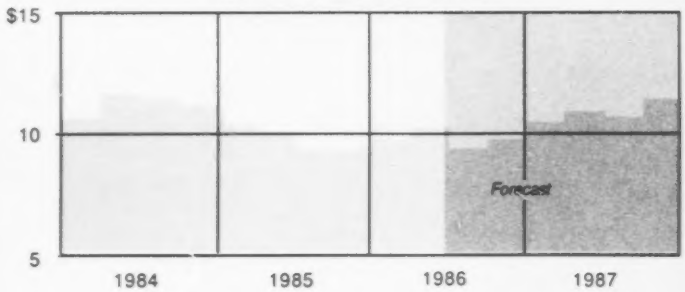
Shipments
Component manufacturers shipped $10.18 billion worth of products in this year's second quarter, an increase of about 1.1% over the total for the same period of 1985. This was the strongest level of market activity in more than a year and came in response to the brisk increase in orders between August of 1985 and March of 1986. The market reversed direction this summer and will improve only slightly during the fourth quarter, held back by the recent slump in orders. As a result, shipments are expected to grow just 0.9% to $39.2 billion this year, followed by gains of 11.3% in 1987 and 18.9% in 1988. These performances compare to a sharp 13.4% loss in 1985.

Inventory-to-shipment ratio
The component industry's ratio of inventories to shipments was 1.83 in the second quarter, unchanged from the level in the first three months of this year. This was near the upper limit of the 1.75 to 1.85 range which was previously expected for 1986. A slackening in both shipments and inventories during the second half of this year should keep the I/S ratio balanced near its current level. Improved shipment activity in 1987 and 1988 is expected to pull the ratio downward. The I/S ratio should reach about 1.65 by the end of next year and could break below 1.6 in late 1988.

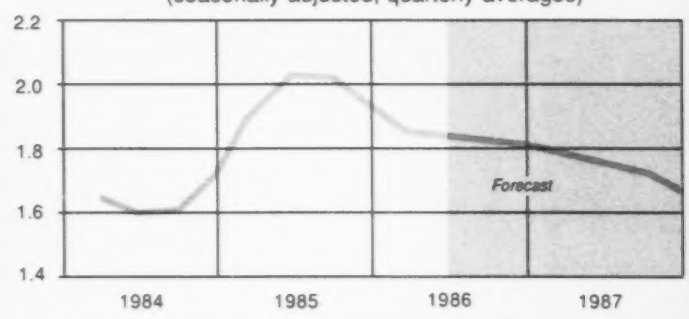
Electronic components (SIC 367)



Electronic components: Shipments
(quarterly totals, $ billions)



Electronic components: Inventory-to-shipment ratio
(seasonally adjusted, quarterly averages)



Historical data: U.S. Department of Commerce
Forecast: Cahners Economics

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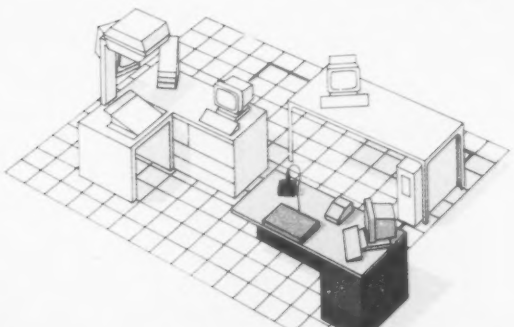

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LETTERS

A worthy review

I thought your review of An Wang's autobiography [Sept. 15, p148] was exceptionally good. Not only did you provide a good idea of what the book is about, but you added an up-to-the-minute update on the fortunes of Wang and his company. I can't think of another reviewer who could have done it as well. Congratulations.

LON CANTOR
Director Communications & Advertising
RCA
Somerville, N.J.

Correction

The article on 3.5-inch and 5.25-inch disk drives [ELECTRONIC BUSINESS, August 1, 1986, p81] included last year's market forecasts for sales of floppy disk drives in North America. ELECTRONIC BUSINESS apologizes for publishing the data which, unknown to us, had already been revised. The newly revised projections for that market indicate the following:

	5.25-inch drives (Units, in millions)	3- to 3.5-inch drives (Units, in thousands)
1984	7.69	272.0
1985	8.26	603.0
1986	10.03	890.0
1987	11.06	2,100.0
1988	10.53	4,785.0
1989	9.47	8,040.0

Source: Dataquest Inc.

Correction

In the September 15 issue of ELECTRONIC BUSINESS in an article entitled "PCB CAD: More slices from a larger pie," the magazine incorrectly reported that Vectron Graphic Systems had gone out of business. Vectron Graphic Systems continues to operate under Chapter 11 of the U.S. bankruptcy code.

Letters to the editor

ELECTRONIC BUSINESS welcomes letters to the editor on any topic of interest to our readers. If not written on organizational letterhead, all letters must include a telephone number. ELECTRONIC BUSINESS reserves the right to edit letters.

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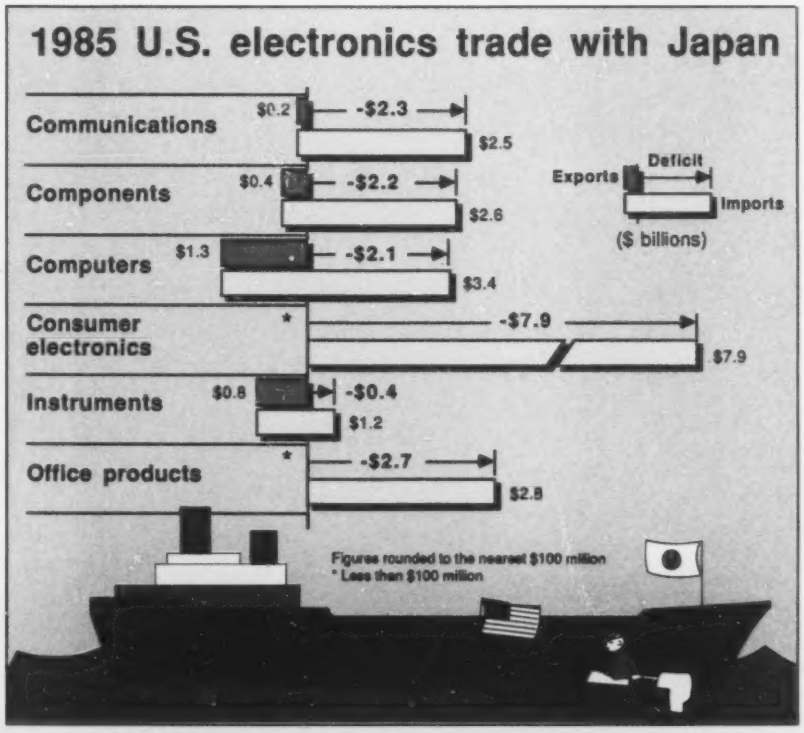
Stephen Levy: Restoring manufacturing vitality

The outgoing chairman of the AEA outlines his views on trade, industrial policy and tax reform

Stephen R. Levy, chairman and chief executive of Bolt, Beranek and Newman Inc. has served as chairman of the American Electronics Association (AEA) during 1986. Levy, 46, has sought to focus AEA attention and resources on the issue of the declining international competitiveness of U.S. manufacturers. Levy said his efforts have involved "making our members aware of the problem and engaging them in the effort to reverse the decline." Levy contends that the U.S. government, which often bases its decisions on military and geopolitical concerns, must begin making decisions geared toward restoring this country's manufacturing vitality. During more than two hours of interviews with senior editor Norm Alster, Levy outlined his views on trade, industrial policy, tax reform and Japanese business practices. Here are excerpts from Levy's comments:

1. On the U.S. trade deficit with Japan:

"Our country cannot address the bilateral trade problem with Japan without addressing electronics and automobiles. Electronics and automobiles each account for roughly one-third of the bilateral trade deficit. Unfortunately, the electronics trade deficit is growing faster than any other part of the trade deficit and it's not confined to consumer electronics. It's extending to industrial electronics as well: components, telecommunications, office automation products, instrumentation. Virtually every aspect of the electronics industry has experienced erosion over the last five years in terms of its bilateral trade with Japan. The fact of the matter is we import, as a nation, nearly $21 billion of electronics goods from Japan and we export $3 billion to them. It's hard to understand why, with the strength of the U.S. electronics industry, we've been so unsuccessful."



2. On restoring U.S. industrial competitiveness:

"First, we must develop policies that encourage savings and investment. We must improve and expand our capacity to create and apply technology through adequate investment in R&D [research and development] and plant and equipment and by enhancing the technology training and skills of our citizenry. Right now, the level of U.S. investment in manufacturing plant and equipment per year, per employee, runs about one-third of the Japanese level of investment. We need increased investment in plant and equipment and expanded investment in the training and education of our people. Then we have to enforce trade laws and provide improved protection for intellectual property. And finally, we have to make trade a national priority and give it equal status with defense and state."

3. On the ability of the U.S. government and public to focus on rebuilding America's manufacturing base:

"The issues are very deep. It's taken us 10 or 15 years to work ourselves into our current problems. It's going to take a decade for us to work ourselves out of them. . . . The U.S. has a great capacity for change. We can do polarity shifts faster than anyone in the world. Usually, it takes a crisis to produce a polarity shift. We did, for example, change our habits in a fundamental way as far as energy was concerned. Today, we are producing 35% more goods and services than in 1973 with almost exactly the same consumption of energy. . . . You have to acknowledge the problem. You have to set goals. I believe restoring the competitiveness of our manufac-

turing industries should be a national goal. Then you have to set objectives that allow you to measure your progress toward meeting that goal. I think a reasonable goal is to restore U.S. manufacturing to competitiveness as measured by a balance of trade in manufacturing goods by the early 1990s. That will take a lot of work. But with a goal and objectives, our country can adopt the proper policies."

4. On trade and national defense:

"As a nation, we have to make trade a national priority. It is not a priority today. It takes a backseat to matters of state and defense. . . . We've got 6.5% of our gross national product in defense. They [Japan] spend 1%. They are the beneficiaries [of our defense spending]. With that 5.5% difference, Japan has $100 billion that it can allocate differently. We've decided to put it into defense. They have decided, I believe, to achieve domination in the Information Age comparable to the domination they feel the U.S. had in the Industrial Age. . . . We cannot have a strong national defense without a strong economy. And we can't have a strong economy without a strong manufacturing industry."

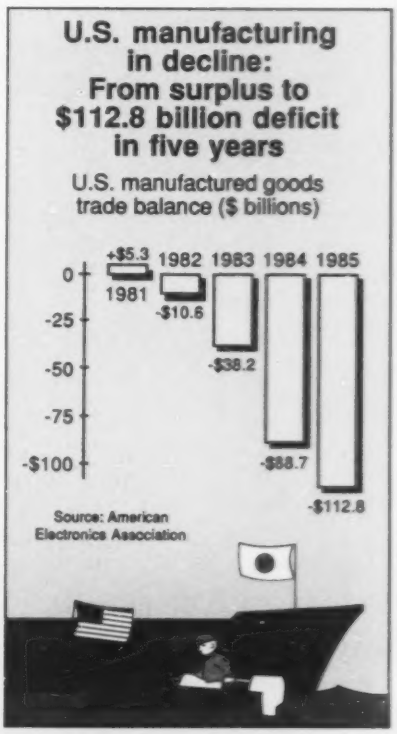
5. On lowering the cost of capital for U.S. manufacturers:

"A principal determinant of the cost of capital is the savings rate, which drives interest rates. The Japanese savings rate is four or five times our savings rate. They have, in effect, a surplus of savings. That surplus of savings drives down their interest rates. . . . Part of the reason that our cost of capital is so high is that we have fiscal policies — budget deficits — that are much too high. The nation is spending far too much in relationship to what it produces. Our tax and credit policies encourage consumption instead of saving. We need greater savings to keep our interest costs down and to improve our capital formation."

6. On the new tax reform legislation:

"I would have liked to have seen more to encourage savings and investment. I would have liked preservation of the capital gains differential. I would have liked the exemption of savings from taxation up to a certain amount for all individuals. Those kinds of modifications in the tax code would have been more in line with what we've encouraged to improve competitiveness. . . . On the positive side, certainly within the industrial sector, the tax bill has served to level the playing field. Since profitable high-technology companies tend to pay at or near the statutory rate, the rate reduction will generally make profitable high-technology companies net beneficiaries. There's also some benefit in the preservation — although on a scaled-back basis — of the R&D tax credit. But when all is said and done this tax bill does add $120 billion to corporate taxes and transfers the benefits through the lowering of personal taxes. The increase in corporate taxes cannot be good for industry in general. Even though we in high technology may be beneficiaries, the people we sell to are the ones who are seeing their tax bills go up."

AEA CHAIRMAN STEPHEN LEVY: "We have to make trade a national priority"



7. On Japanese business practices:

"I have great admiration for Japan and the Japanese people and what they've accomplished. It's difficult for me as an American to denigrate in any way a people who work hard, who save a lot of what they earn, who value quality, who value education. The fact that the Japanese have been successful in improving the standard of living of their people is something we should applaud . . . and I believe the Japanese do scrupulously adhere to the terms of agreements they reach. But I also believe they operate with a clearer consensus as to what their national goals and objectives are and adopt policies and practices that are consistent with those goals and objectives. And some of those policies and practices violate the spirit, if not the letter, of trade agreements and trade laws that we have and that exist around the

world. These practices include targeting, dumping and the exclusion of foreign manufacturers from their domestic markets. [Levy then talks about Japan's technology acquisition practices.]

"There's another thing they've done which I wouldn't say actually violates patent laws, but, if they believe a particular company or country is ahead of them in some particular area, they will try to get that technology. They are prodigious collectors of information, analyzers and distributors of information. They've used licensing agreements and joint ventures very effectively. They have, for a number of years, precluded entry into their market by a foreign company, unless that company did it through a joint venture that allowed the Japanese partner to acquire the skills and knowledge about that particular technology. And once they did and built their own skills, often those joint ventures were dissolved."

8. On the impact of the yen's appreciation on Japanese manufacturers:

"Japanese companies have been forced to accept smaller profit margins because they were unwilling to pass on price increases that might cost them market share, particularly in relationship to consumer electronics. The Koreans have been one of the beneficiaries of this realignment in currencies. They've picked up a 40% currency advantage over Japan. To the extent that the Japanese companies raise prices, they will in effect provide a pricing umbrella for Korea and Hong Kong and, to some extent, Taiwan, to come in under. Clearly, what's happened is there has to have been some pressure on their profit margins or they've had to improve their manufacturing efficiencies. And they've had a short period of time in which to do that. More likely — and you see every evidence of it — they've been willing to accept smaller margins. And how long can they continue to accept smaller margins?" □

Expert systems: Finding applications in electronics

The $140-million expert system market is still in the development stages, with lots of activity in prototyping

Expert systems — the artificial-intelligence (AI) software programs which do everything from configure computer systems to monitor soup cookers — are the best known segment of AI. The early leaders in expert system development and installation are well-established giants: AT&T, Digital Equipment Corp., Honeywell Inc., IBM, Sperry Corp. and Texas Instruments Inc.

But now, it seems, almost every other major electronics company, and some minor ones, have also gotten into the expert system act. Between February and August of this year, the number of known expert systems employed within *Fortune* 1000 corporations rose from 50 to 150, according to Paul Harmon, editor of "Expert Systems Strategies," a San Francisco-based newsletter. And for every known expert system used at a major corporation, he maintains, there are eight or nine other expert systems that the *Fortune* 1000 crowd considers too sensitive to divulge. By the end of the year, however, the number of routinely discussed expert systems will be pushing 1,000, Harmon predicts.

As a result, expert systems are the most profitable type of AI software. By the end of 1986, expert systems revenue will reach $140 million, representing 13% of this year's total $1 billion AI-hardware and -software market, according to D.M. Data Inc. (Sales of AI hardware that is used to develop and deliver AI software comprise roughly 50% of the total AI market.) By 1990, the market for expert-system tools and complete systems will reach $810 million, the Scottsdale, Arizona-based market research firm claims.

Currently, most expert systems are based on small- to medium-sized software programs which take between three months to a year to develop. The majority of existing systems were developed for in-house use only in areas such as diagnostics, maintenance and troubleshooting. Half of all expert systems are custom-designed from scratch, according to D.M. Data analyst Harvey Newquist. Forty-five percent of them use some type of frame-

A sampling of electronics-related expert systems

Name of system	Developer and/or owner	Domain and task	Usage
ACE	Bell Labs (AT&T)	Troubleshoots cable systems and recommends maintenance	Internal
BDS	Lockheed	Troubleshoots communication hardware	Internal
BEACON	Burroughs	Configures Burroughs computers	Internal
Capital Asset Process Advisor	IBM	Assists in developing procedures for moving capital equipment	Internal
COCOMO1	Level Five Research	Assists in planning and scheduling software development	For sale
COMPASS	GTE	Troubleshoots telephone-switching equipment	Internal
CONAD	Nixdorf	Checks orders and configures Nixdorf computers	Internal
CSF Advisor	IBM	Guides development of cost estimate for moving DP equipment	For sale
DART	IBM	Diagnoses computer faults	Internal
DIA 8100	Teknowledge for Traveler's Insurance	Diagnoses failures of DP equipment	Internal
Dispatcher	DEC	Assists in maintaining inventory records	Internal
DRAGON	Systems Designers Software for ICL	Configures orders for ICL's Series 39 computers	Internal
ESPm	NCR	Analyzes computer maintenance logs to identify future faults	Internal

(Table continued on page 34)

sor. The tutor teaches scope customers how to use the oscilloscope.

Meanwhile, Ford Motor Co. is working on a similar computer-aided instruction project. Using Texas Instruments' Personal Consultant expert-system building package for personal computers, Ford built a diagnostic expert system for its robotic equipment. It reportedly has shipped to all of its robotics vendors, who use the expert system to take them step-by-step through diagnostic routines. Previously, operators had to diagnose a robot malfunction using pages and pages of documentation.

Honeywell Inc. in Minneapolis has also implemented several expert systems. One, called the Intelligent Software Configurator, helps customer-service engineers install computer systems. The other, PAGE-1, is a troubleshooter for its top-of-the-line page printer. The systems, developed concurrently using Xerox 1100 AI workstations and the Interlisp and Loops programming aids, took about a year to devise, according to Barbara Braden, manager of advanced technology for the customer services division. The company is also looking at expert systems for troubleshooting disk drives, identifying software problems and other applications.

Once a company starts looking for ways to use expert systems to solve problems, analysts say, it is only a matter of time before a potential application is found. "We've seen quite a number of projects that were done because someone else proved it could be done," newsletter editor Harmon says. Indeed, almost every computer company involved in AI has built and deployed remarkably similar configurators, troubleshooters and the like.

The result is a shotgun approach to AI, involving numerous applications. This month NCR Corp. of Dayton, Ohio, for example, is slated to deploy an innovative system called ESPm, short for Expert System for Preventative Maintenance. While other expert systems suggest hardware repairs only after a system is down, ESPm alerts customer service representatives of potential problems, based on the unusual events recorded in the daily logs of NCR's 9300 superminis. The system, which runs on NCR Tower superminis, took two years to build using Teknowledge's S.1 shell, says Nelson Hazeltine, NCR's acting director of advanced software technologies. The system is one of 17 expert systems currently in place at NCR.

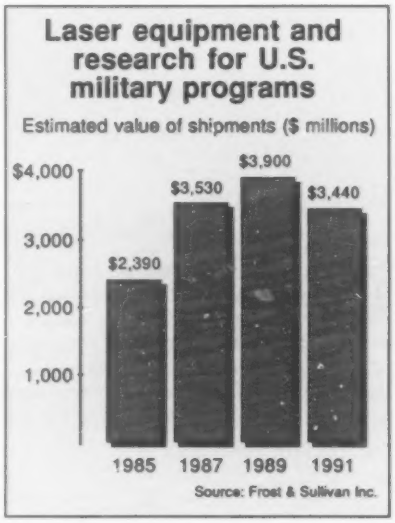
MARY JO FOLEY

Electronic warfare: Laser market still shows luster

"Star Wars" may grab the headlines, but the market for ground-based laser systems is where all the action is

Despite talk of strategic defense and a space-based laser bulwark against ballistic missiles, the bulk of the money spent on military lasers still goes for ground-based systems. That is good news for manufacturers of defense electronics gear, many of whom are worried that political opposition to President Reagan's Strategic Defense Initiative (SDI) may one day blast it out of the political skies.

First used in the Vietnam War to guide bombs to their targets, lasers have become an integral part of many so-called "smart weapons" in today's electronic warfare arsenal. They are used in fire-control systems for jetfighters, navigation devices for helicopters and as precise guidance for artillery and missiles.



Tactical or nonnuclear programs account for about two-thirds of the $3.2 billion in fiscal year 1986 expenditures for lasers — with missile guidance leading aircraft navigation and battlefield surveillance systems, according to a recent report by by Frost & Sullivan Inc., an international market research firm.

Lasers have two principal military uses in tactical warfare. One is to illuminate targets which can then be hit with a variety of missiles and artillery shells. The other is as a range finder to provide accurate measurements for navigation of vehicles, helicopters and planes.

"The laser illuminates the target and the missile receives the reflected energy," says Seymour Zeiberg, vice president of technical operations at Martin Marietta Corp.'s aerospace operations in Orlando, Fla. "Or you shoot out a beam and receive very, very precise measurements."

At $798 million in reports for fiscal year 1986, missile programs make up about one-fourth of the total laser market, with aircraft programs accounting for $691 million and battlefield programs at $621 million. Army weapons programs dominate the missile sector, Frost & Sullivan says, with the single largest item being the laser-guided Hellfire missile. The Copperhead missile's laser-guided artillery round is also a major recipient of Pentagon dollars.

Martin Marietta is the prime contractor for both Hellfire and Copperhead. In fiscal year 1985, the company had 18.6% of the military laser market, followed closely by Hughes Aircraft Co. at 17.6%. Rockwell International Corp. was a distant third with 6.7%.

Leave it to Litton

The preeminence of Martin is ironic in that the Bethesda, Maryland-based electronic warfare supplier no longer makes lasers. Indeed, it integrates lasers it buys from other suppliers at its operation in Orlando. Many of its lasers come from Litton Industries Inc.'s Laser Systems unit, the Orlando-based arm of the defense and technology conglomerate located in Beverly Hills, Calif.

Litton Lasers' vice president of business development, J.J. Battaglia, says the company expects "a very comfortable growth rate without dipping into SDI work. We have sort of become predominant in the tactical arena." Litton does not break out revenue for individual groups but the Orlando division does "in excess of

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$20 million annually," says president Maurice R. "Bud" Yeager.

Four Martin programs — the Hellfire, Copperhead, the Lantirn night-targeting and vision system for the F-16, and Apache helicopter — accounted for about $1 billion in sales last year for Martin's Orlando division. The lasers, however, are only a very small part of each complex weapons system.

"There are a variety of smart munitions, but one component of that is the laser-guided weapon," says William Schwartz, who helped direct Martin's laser work before forming his own company, International Laser Systems Inc., and then selling it to Litton in May 1983.

Lasers have their limits, though. Operating one can be a dangerous experience. The user risks the threat of eye damage, or worse, the possibility of being killed by an enemy round. Laser operators often have to assume positions forward of tanks and other battlefield vehicles. To combat these problems, laser companies are working to develop lasers that are less harmful to the eye and ways to shield laser operators from enemy attack, such as placing them inside armored vehicles or eliminating the user altogether, as is the case with the remotely piloted Aquila drone.

Martin recently received a $17.9 million research contract to build a prototype elevated targeting and acquisition system, which might position a laser atop a 50-foot telescopic pole mounted on an armored vehicle. The concept is similar to that already in use on scout helicopters, where the laser is mounted on the tip of the rotor.

Despite the current emphasis on ground-based systems, it is the dream of building a wall in space to deter enemy nuclear missiles that will drive the military laser market in future years, Frost & Sullivan says.

"Laser-designating guidance as a firm technique for precision-guided munitions show signs of slowing down," says Frank Meyer, Frost & Sullivan's project director. "Procurement gaps are evident in all branches of the armed forces, both in the equipment carrying laser designators and in the laser-designation method for targeting."

Still, laser marketers like Litton's Battaglia point out that many existing weapons systems — the Apache attack helicopter being one example — are set for upgrades and that could involve the improvement of the laser.

TIM SMART

Suppliers to the U.S. military laser market

Estimated value of fiscal 1985 U.S. shipments

Supplier	Value ($ millions)	Market share
Martin Marietta	$444	18.6%
Hughes Aircraft	420	17.6%
Rockwell	161	6.7%
Texas Instruments	145	6.1%
Litton Industries	89	3.7%
Kollsman Instrument	77	3.2%
McDonnell Douglas	75	3.1%
Loral Electro-Optical	74	3.1%
TRW	66	2.8%
Los Alamos Laboratory	65	2.7%
Lockheed Missiles	63	2.6%
Livermore Laboratory	61	2.6%
Emerson Electric	49	2.1%
Avco Textron	48	2.0%
Northrop	29	1.2%
Perkin-Elmer	25	1.0%
Ford Aerospace	24	1.0%
BDM	22	0.9%
Draper Laboratory	18	0.8%
Boeing Aerospace	13	0.5%
Westinghouse Electric	12	0.5%
LTV Aerospace	11	0.5%
Optic-Electronic	10	0.4%
United Technologies	$9	0.4%
General Dynamics	8	0.3%
Penole	6	0.3%
Schafer Associates	6	0.3%
Science Applications	6	0.3%
Sperry	6	0.3%
R&D Associates	4	0.2%
RCA Automated Systems	4	0.2%
Singer Kearfott	4	0.2%
Teledyne Brown	4	0.2%
GTE Electro-Optics	3	0.1%
Honeywell	3	0.1%
MIT Lincoln Laboratory	3	0.1%
Sanders Associates	3	0.1%
Sandia Laboratories	3	0.1%
Stanford University	3	0.1%
Aerospace	2	0.1%
Arvin Calspan	2	0.1%
Eastman Kodak	2	0.1%
Western Research	2	0.1%
Other	306	12.8%
Total market	**$2,390**	**100%**

Source: Frust & Sullivan Inc.

Japanese printer makers look for ways to cut costs

The disparity between the dollar and the yen is forcing Japanese printer manufacturers to rethink their strategies

The value of the dollar against the yen has dropped more than 60% in the past year, but so far Japanese manufacturers have been able to hold price increases on serial and line printers to between 5% and 10%. Vendors claim that they have been able to do this by introducing new models with higher price performance.

Profit margins, however, are under severe pressure. As a result, many vendors are scrambling to find new ways to reduce costs.

The OKI Data Group of OKI America Inc., for example, has resorted to containerization to help reduce trans-Pacific shipping costs. The parent company in Japan is also continuing to invest heavily in automation, according to James Cullen, OKI Data's director of marketing in Mount Laurel, N.J. Smart as Oki is, Cullen adds, the company would be remiss if it it were not looking at the possibility of shifting some Japanese production offshore to cheaper labor markets in Southeast Asia.

In addition, other firms are emphasizing more standardized componentry. Clearly the intent is "to cut out the [more costly] human interface as much as possible," comments Bhanu Bhattasali, a printer analyst at Dataquest Inc. in San Jose, Calif.

Meanwhile, state side subsidiaries are being asked to hold the line on sales costs and re-examine spending. "In the U.S. we've maintained the status quo in fixed costs for sales and distribution even though sales have increased," reports Andrew Leonard, vice president of marketing for Epson America in Torrance, Calif., part of Seiko Epson Corp.

Can Brother spare a dime?

Brother International Corp., Piscataway, N.J., meanwhile is redoing budgets for trade shows, salaries, commissions and advertising. In some cases, it has even arranged for products to be shipped directly from the factory to large accounts. "It eliminates our warehousing costs and we're able to pass that on to our accounts," Alex Schibanoff, operations manager for Brother's Information Systems and Peripherals division, says.

Some printer makers are also building or planning to build plants in the United States. The move may primarily be a hedge against the threat of increased duties on Japanese goods, but it also promises to cut manufacturing costs and speed up turnaround — the time it takes between when an order is received and when a customer receives the finished product.

NEC, for example, which manufactures 30% to 40% of its printer accessories in the United States, is in the midst of moving printer manufacturing here. John McIntyre, product manager for serial and line printers at the $300 million firm, says that the move will take "a number of years" to accomplish. Meanwhile, "a consumables line is a key element in a company's financial strength, and our capability to source in the U.S. helps us a little," he says.

Epson, too, has opened a printer plant in Portland, Ore., partly "for cost reasons, but [also] for shorter turnaround to meet demand, and to have a U.S. presence," Leonard says. And Brother is also looking for a site in the United States to manufacture typewriters initially, and other products, possibly including printers, to follow. The diversified electronics company currently manufactures typewriters in Brazil and sewing machines in Ireland, but so far it does not source printer parts outside of Japan.

U.S. printer shipments

	Value ($ billions)	Units (thousands)
Serial printers		
1985	$3.4	5,100
1986	$3.7	5,800
Line printers		
1985	$1.6	127
1986	$1.6	133
Page printers		
1985	$1.1	137
1986	$2.1	284

Source: Dataquest Inc.

Meanwhile, American printer makers — including Hewlett-Packard Co., IBM and Xerox Corp. are capitalizing on the strong yen to gain ground, particularly in the higher priced line and page printer market segments. Xerox of Stamford, Conn., for example, reports it has not raised or lowered prices all year. "We've been at a price disadvantage against the Japanese until now and this is restoring parity. In the past we've struggled with the strong dollar. This equalizes things," says Michael Winkler, vice president of Xerox's centralized strategic business unit. The company, which saw printer revenue rise 50% in 1985, says that printers account for about 15% of total income. This fall, Xerox will begin augmenting sales of low-end products through its dedicated salesforce with distribution through retailers, distributors, value-added resellers and other channels.

One problem U.S. vendors have, however, is that many of them source Japanese componentry from Japan. Like many other American printer makers, Hewlett-Packard, for example, uses Canon engines in its printers, and as the price of those engines increases, that puts pressure on U.S.-built machines. "The value of our dollar is decreasing for the price we have to buy engines," a Hewlett-Packard official concedes. But the company says that it has no plan to either increase or decrease prices in the near future.

But for Japanese printer companies, the struggle goes on. "The major players have the volume to sustain a profitable business," Dataquest's Bhattasali says. "It's the smaller [Japanese] companies that are likely to get squeezed. They'll have to rethink their strategies if they want to stay in this market."

Some U.S. companies even think the gray cloud of a strong yen may actually be hiding a silver lining. Says Epson's Leonard: "Ultimately, this will make us more efficient. In the future, we'll look toward a value-added strategy rather than answering every competitive foray with a price move."

MICHELLE VRANIZAN

Vranizan is a Los Angeles-based business writer

ATMs: A fast-growth market flattens out

The automatic teller machine market may be reaching maturity, as banks tighten up on capital expenditures

The market for computerized automated teller machines (ATMs), a high-growth market in the early 1980s, is suddenly quite flat. In 1985, U.S. shipments totaled 8,343 units, down from nearly 14,000 in 1983, according to Linda Zimmer, a Marlborough, Connecticut-based independent analyst. And most industry sources agree that the market will be lucky if it is able to top that 1985 figure by year-end.

What has happened to dampen the spirits of the ATM market which just three years ago was boasting shipments of almost 14,000?

Vendors and analysts believe one of the major problems affecting the ATM market has been tighter controls on expenses. ATMs run about $30,000 each, and including the cost of installation and service contracts, a bank can spend as much as $75,000 to set up one machine. In these days of declining interest rates, while banks are trying to find ways to boost their profits, the flip side of the coin is controlling expenses.

But more importantly, banks which have installed ATMs over the past few years have not yet been able to get customers to use the machines in large enough volume to make it a cost-effective tool. "Huge numbers of ATMs were installed because of the network explosion, but there was no marketing to follow suit," analyst Zimmer says. The machines are now in place but somehow the customers are not being reached. Consequently, the client volume per ATM is declining.

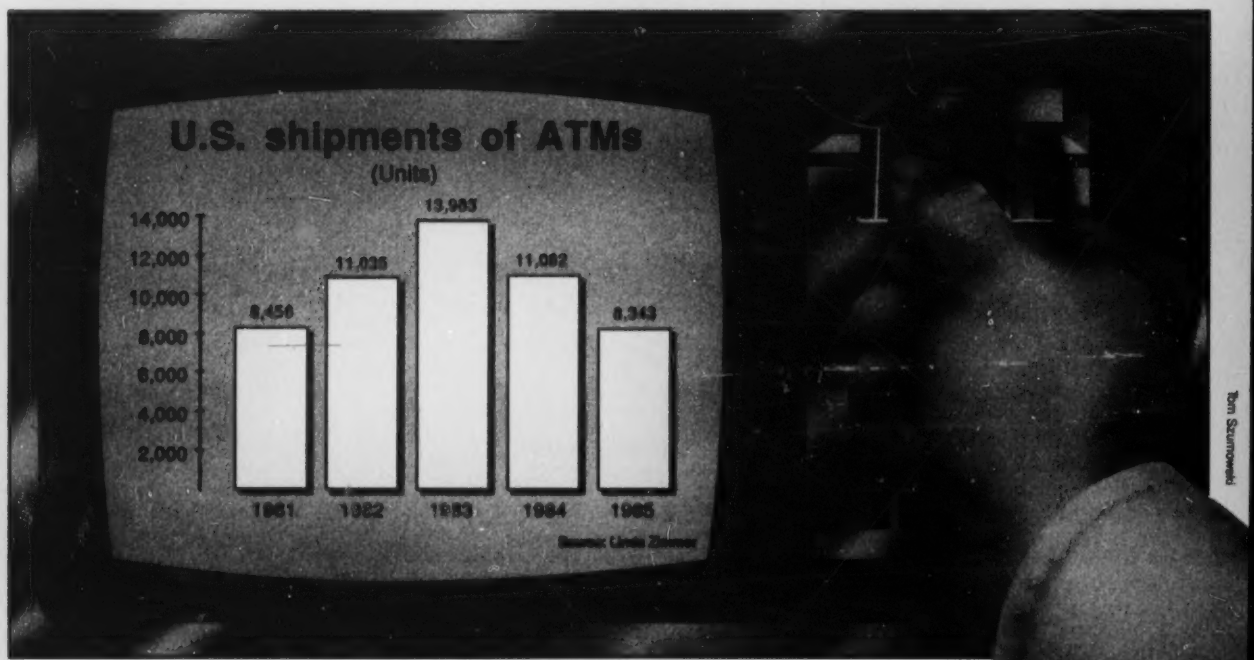
Two years ago, on the other hand, the average machine sported about 6,700 transactions per month. That number now stands at about 5,500 monthly transactions per machine. And no one is quite sure how to increase the ATM customer base.

Virgil Freeman, vice president and general manager of the electronic funds transfer (EFT) division at Olivetti U.S.A. in Dallas believes another problem may be that banks just have not had time to pay attention to the future of electronic banking. In recent years, merger and acquisition activity has dominated the banking industry, Freeman notes, and this has drawn attention away from investments in technology. Those banks that want to do the acquiring really need to keep their assets as liquid as possible and are delaying any major capital expenditures until their acquisition programs have been sorted out, he says. With uncertainty about the way bank mergers and acquisitions are shaping up, a lot of potential bank customers are holding off making any decisions related to electronic banking until they know whether they will be acquired or be a survivor.

Economic considerations

Another element of the same picture is that the economy in some parts of the country has not been all that rosy. The economic recovery has been fairly regional and banks located in some of the more depressed areas, such as the Southwest and Midwest, have seen some pressure on their earnings. Again, in an effort to prop up that balance sheet, a number of banks are trying to keep a tight fist on expenditures. ATMs have been put on the back burner.

Kevin Murphy, senior vice president of marketing for Fujitsu America, Inc., does not see anything in the near future that will take the ATM manufacturers above the 8,000 to 10,000 shipment level. Fujitsu, which entered the ATM market in the United States about 1984, has tried to find its



market niche by concentrating on building off-premises banking machines, especially the type that will be installed in retail outlets such as grocery stores, variety stores and convenience food stores.

While Fujitsu goes after the off-premises market, other experts believe the ATM market will be helped in the future by the need for replacement equipment. "The financial industry is finding that the installed base [of ATMs] is aging and is getting troublesome," Olivetti's Freeman says. In fact, Zimmer estimates that about 25% of the shipments in 1985 were for replacement machines. Other industry experts expect that a sizable portion of future demand for the machines will come about as existing ATMs start to wear out.

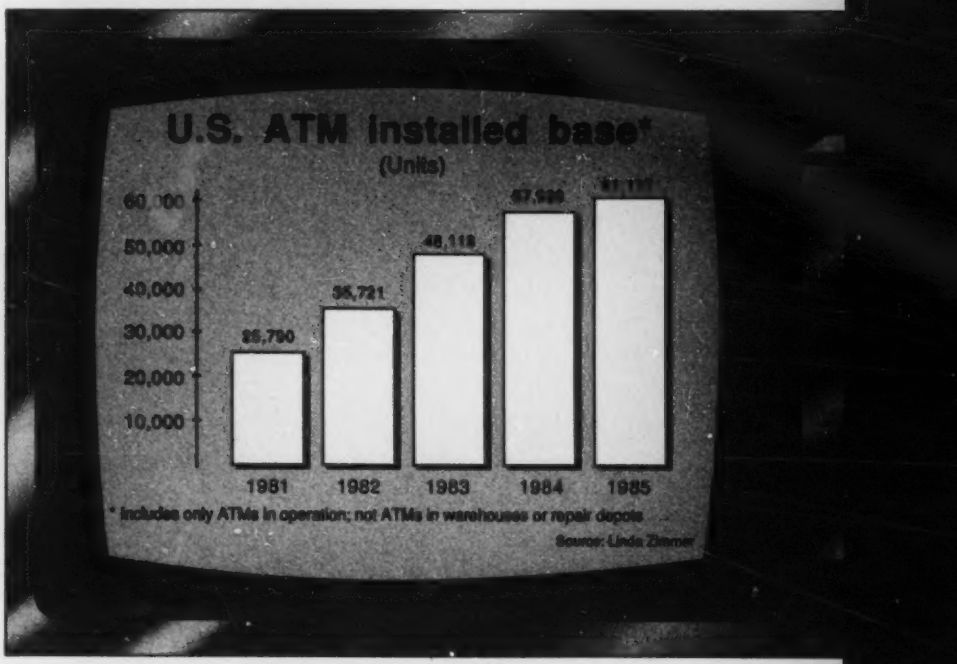
One bright spot for future ATM purchasers is that the average cost of an ATM is one-half to two-thirds of what it was two years ago. Additionally, the average maintenance cost has been cut by 50% to 60%. Some of that has to do with the new technology for ATMs — which is making the machines more reliable and easier to service, Freeman says. Also, manufacturers are offering financial institutions very attractive financing plans and leasing plans for the equipment.

But another reason for the lower cost is that the ATM manufacturers are very competitive and some of the vendors have decided to compete by cutting prices.

About the time when shipments of installed ATMs declined dramatically and demand was nowhere near reaching the level of available product, the market became even more glutted as two Japanese manufacturers, Omron Tateisi Electronics Co. and Fujitsu entered the competitive fray. In 1984 NCR Corp. was still a relative small player with about 8% of the market and the market leaders were clearly Diebold Inc., IBM and Olivetti.

But the rankings have changed. The two Japanese companies made some small inroads in the ATM market in the United States, but perhaps more noticeable is that NCR is said to have made a significant and definitive increase in its market share through price cutting. As one competitor, who asked not to be identified, puts it, "NCR has done a very good job of getting serious about ATMs and closing sales."

While market share numbers for this business are a bit elusive, manufacturing sources line up the U.S. contestants like this: Diebold 40% (down from 50% two years ago), IBM 15% (down from 20%), NCR 15% (up from 8%), Olivetti 15% (down from 20%) and the remainder is split between Omron, Fujitsu and other smaller manufacturers.



Promoting use

Some industry observers also believe the market is suffering from a lack of adequate publicity. While some banks have undertaken such ATM promotions as vacation giveaways, other banks — in fact the majority — have done little or nothing to encourage customers to use the machines. Manufacturers agree that until this problem is taken care of, it is unlikely the customer base will increase dramatically. They also believe it is up to the banks to get customers to use electronic banking.

But some banks do not want to undertake advertising campaigns because they are concerned that it will benefit their competitors who are also hooked onto the same network. Other banks are getting around that by charging customers for using another bank's ATM within the same network.

During this lull in activity some banks may be taking the opportunity to actually plan what they want in the way of ATM systems down the road. Perhaps some banks may want to focus just on promoting the use of cash dispensers, since about 80% of all transactions are cash withdrawals. Not only are cash dispensers cheaper to buy, but it requires considerably fewer transactions in order to reach the break-even level.

Or perhaps some banks want to develop a complementary family of terminals. In a high-volume location, perhaps it would make sense to have a full-service ATM adjacent to a cash dispenser. In a low-service area perhaps just one type of machine would suffice. In other locations, a bank may find it makes sense to have interactive terminals that would display information on interest rates, investment opportunities or the different banking services that are available.

The future of EFT may also include other things, however, says Robert Jansen, president of Omron Financial Systems of Los Colinas, Texas, a subsidiary of Omron Tateisi Electronics Co. "EFT could also be the ability to handle the dispensing and taking in of commodities other than cash," says Jansen. "This might be a ticket to an event or a money order, for instance." And these prospects could open up new opportunities for financial institutions as well.

But until the banking industry works out some of its own problems, analyst Zimmer does not see much change in the near future for ATMs. And for the next 18 months her outlook is for a pretty flat market.

LISABETH WEINER

Weiner is a Chicago-based business writer

Strategic shift: Japan searches for new formula

Low-cost production and consumer products are no longer Japanese monopolies. Exports have begun to suffer

By Norm Alster

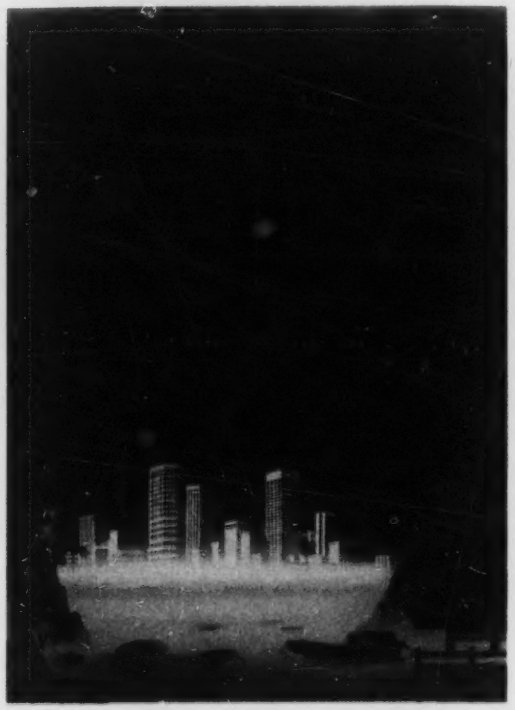
Several months ago, when the yen-dollar ratio first dipped below 160:1, Akio Tanii, president of Matsushita Electric Industrial Company Ltd. characterized the currency situation as "extremely severe." Although Matsushita was said to be making "a great effort to cope with the situation," the adverse impact of a 160:1 ratio, according to Tanii, "far exceeds the corporate limit of our efforts." Tanii's proposed solution to the problem was intriguing. He called on the Japanese government and the Bank of Japan to immediately implement a powerful program to expand domestic (Japanese) consumption.

Like so many pronouncements recently emanating from Tokyo, Tanii's words carry a strange ring. The Japanese, known for years for their export orientation, for their mastery of commodity manufacturing and for their high personal-savings rates, are now talking more and more about importing commodities and raw materials, establishing their own manufacturing overseas, counting less on export growth, concentrating on the higher value-added end of markets and stimulating domestic consumption at the expense of savings.

Already, there are two schools of thought on what Japan's new direction means for its American and European competitors. Some observers believe that, with the Japanese deviating from what has been a remarkably successful economic strategy, its rivals stand at a point of rare and unprecedented opportunity. But others argue that Japan is not really reversing course but simply accelerating on a course long planned and carefully mapped. That course will bring the Japanese into direct competition with American rivals in the markets and technologies that have so far served as their sanctuary. As such, current conditions may actually represent a moment of maximum peril for Japan's industrial competitors.

But to understand why current conditions offer both danger and opportunity for Japan's rivals, it is important to understand why the Japanese appear to have embarked on an industrial program that deviates so sharply from the successful policies of the last four decades. Essentially, the Japanese now have little choice but to change. A powerful combination of influences — some foreseen and some unforeseen — have undermined their traditional policies and have already begun to damage their financial performance.

During the first quarter of 1986, Japanese gross national product (GNP) declined for the first time in eleven years on a quarter-to-quarter basis. Since Japanese yearly growth rates have averaged double those of the U.S. since the 1960s, ranging roughly between 4% and 12%, an actual decline in GNP represents an abrupt reversal of form. Most ominously, the GNP drop of 0.5% actually concealed a more dramatic 4.9% drop in exports, the lifeblood of Japan's economy for more than two decades. Consumer giant Matsushita, for example, saw its exports drop by 17% in the first six months of 1986, the major factor in an earnings decline of 14%. With export sales down 8%, Hitachi Ltd. experienced its first decline in earnings (off 29%) in eleven years. Fujitsu Ltd.'s net income was off by 56% in the fiscal year ending March 31, 1986. NEC Corp.'s earnings fell by 59% in the same period. No wonder then that the Economic Planning Agency recently pronounced the Japanese economy to have entered recession.



David Biedrzycki

"There are a lot of Japanese companies that are hurting very badly right now," reports Sidney Webb, a member of the board of directors of both Amdahl Corp. and Avnet Corp. and a consultant to several major Japanese electronics firms. Although the

How currency swings, trade friction and new competition have stung the Japanese giants
At Hitachi, exports have faltered...
1984 1,231,000
1985 1,635,000
1986 1,510,992
...leading to the first sales dip since 1975
1984 4,367,144
1985 5,013,298
1986 5,010,459
...cutting deeply into net income.
1984 167,114
1985 210,163
1986 150,218
Year ending March 31, (milions of yen)
Source: Company reports
At Fujitsu, semiconductor and component sales plunged...
1984 217,850
1985 307,416
1986 225,571
...breaking the back of export revenue growth
1984 282,586
1985 420,932
1986 401,165
...and halving earnings.
1984 66,669
1985 89,028
1986 38,930
Year ending March 31, (milions of yen)
Source: Company reports
At Matsushita, video sales have fallen off...
1984 597,300
1985 715,700
1986 586,800
...bringing down overseas sales
1984 1,070,800
1985 1,251,700
1986 1,048,000
...and shaving pretax income.
1984 300,100
1985 349,700
1986 251,100
Six months ending May 20, (milions of yen)
Source: Company reports

MATSUSHITA's TANII called on the Japanese government and the Bank of Japan to expand domestic consumption

Japanese problems run deeper than the 50% appreciation of the yen versus the dollar, there is no denying the painful consequences of currency reversal for Japan's export-driven manufacturers. "When you are focusing on exports like the Japanese, currency fluctuations may be one of the most important variables in your business and may be more important than everything you do," explains Webb.

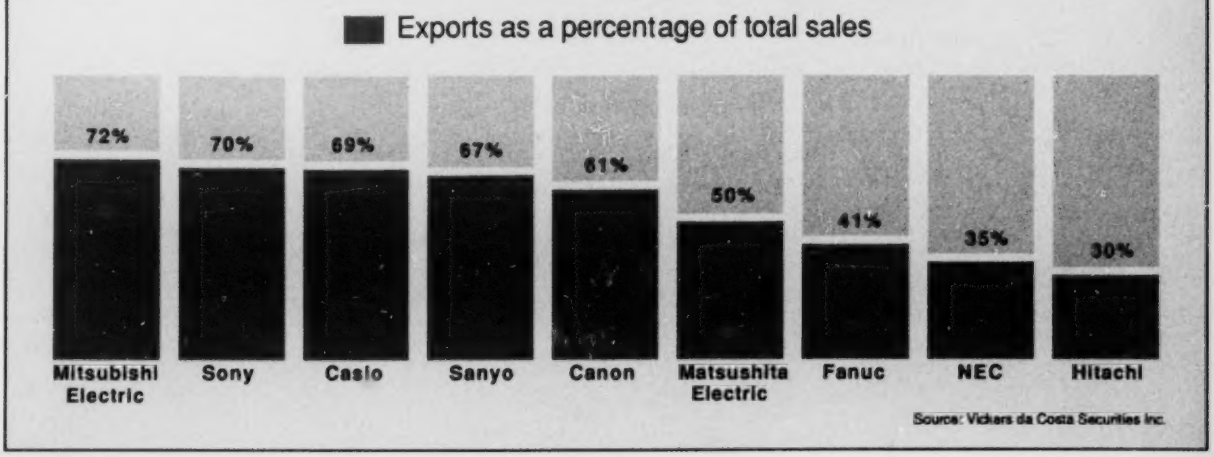
The appreciation of the yen is disruptive because it puts upward pressure on the price of Japan's exports. Japan's economic growth is unusually dependent on exports since its protected domestic markets are already controlled by its own firms. There are, in essence, few foreign-based companies (IBM being the most notable exception) from which market share can be wrested. Thus revenue can be grown in only two ways: by significantly expanding the size of the domestic market or (more typically) by selling abroad. In semiconductors, for example, Japanese producers control roughly 90% of their domestic market. With almost no market share left to win (and with foreign rivals clamoring to increase their own shares), growth for the Japanese must come from significant expansion of domestic demand or from penetration of foreign markets. To this date, of course, the Japanese have been remarkably successful in growing through export sales. In 1964, says Stephen Levy, chairman of the American Electronics Association and chief executive of Bolt Beranek and Newman Inc., Japanese exports of high-technology goods were already 1.5 times as large as their imports. But by 1985, while the U.S. trade deficit in electronics approached $9 billion, Japanese high-tech exports were fully five times as great as their imports.

But now, at the very time that an enormous export advantage (the strength of the dollar) has turned into an equally enormous disadvantage (the strength of the yen) Japan's export-based economic master plan has been challenged on two other fronts. Discontent with Japanese business practices, commonplace but ineffectual for years, has suddenly crystallized into lawsuits, legislation and remedial duties. Meanwhile, new competition from Korea and other Far East countries has challenged Japan's domination in some of its most crucial export markets. While Japanese exports were declining, Korea's exports rose by 24% and Taiwan's by nearly 20%.

Considerable attention has been focused on the semiconductor market, in which Japanese sales in the United States were down close to 22% in the first five months of this year. Although it is still too early to make a definitive assessment, it is likely that the new semiconductor trade agreement, which imposes much higher selling prices on Japanese chips, will (in markets where the Japanese do not hold virtual monopolies) have at least some negative impact. In semiconductors, therefore, it is the combination of currency and trade friction that is hurting Japan. But in a much larger export market — consumer electronics — it is the combination of currency and foreign competition that is taking its toll. "Ten years ago we were producing the black and white television sets. But right now almost all the black and white sets are made in Korea and Taiwan. And some of the color [sets], too," reports Ikuo Makino, director of industrial electronics

Japan's economic growth is unusually dependent on exports since its protected domestic markets are already controlled by its own firms

Japan's dependence on exports



Source: Vickers da Costa Securities Inc.

for the Japan External Trade Organization.

Sanyo Electric Co. and Victor Company of Japan (JVC) now put their labels on color television sets produced by Korean manufacturers. More dramatic is the situation in video cassette recorders. Until recently, the Japanese held a virtual monopoly on video-cassette recorder (VCR) manufacturing. Products sold under American names such as Sears and General Electric are actually produced in Japan. But in 1985, the Koreans managed to sell more than one million VCRs in the United States. And now the Japanese have actually begun to put their labels on VCRs built in Korea. David Rosen, director of the consumer electronics media program for Link Resources Corp., a New York City-based market research firm, says that Sony Corp. and Toshiba Corp. now sell VCRs manufactured by the Daewoo group. And JVC has begun to source some of its products from the Samsung group and the Lucky-Goldstar group. "The Koreans can underprice the Japanese in terms of manufacturing costs," says Rosen.

Beneath the surface

The ability of the Koreans, Taiwanese and others to undercut Japanese pricing on a broadening base of consumer products and computer subassemblies suggests that the Japanese may be losing their most critical competitive advantage: the ability to manufacture high-volume products at lowest cost. The Japanese have always been able to capitalize on low-cost manufacturing to dominate commodity products. But now it appears that

The Japanese may be losing their most critical competitive advantage

low-cost manufacturing itself is evolving into a commodity [ELECTRONIC BUSINESS August 15, 1986 p48].

In one sense, it was the extraordinary level of Japanese manufacturing proficiency that catalyzed this process. Ever since it became evident that the Japanese had advantages in high-volume manufacturing, electronics companies competing with the Japanese have sought to neutralize that advantage. One way was to build plants in countries with even lower labor costs. Today, the expanding electronics industries of Hong Kong, Korea, Singapore and Taiwan are the direct and major economic consequence of such investments by U.S. and European firms. In Korea, for example, semiconductor manufacturing and assembly industries have grown on a base constructed by firms like Fairchild Camera and Instruments (now Fairchild Semiconductor Corp.), Motorola Inc. and Signetics Corp. The presence of these companies attracted and developed the skilled laborforce, accomplished technical class and supplier network necessary to sustain a native industry.

EPSON's TSUBOTA: "We're seeing in Japan now what was happening in the U.S. 10 to 15 years ago. . . Manufacturing plants are moving offshore"

As lower labor-cost competitors have gained strength, the Japanese have tried to keep ahead of the game through automation. But the Japanese have begun to hit the wall of diminishing returns in their own cost-reduction efforts. Jerry Wasserman, a vice president with Arthur D. Little Inc. in Cambridge, Mass., points out that many Japanese electronics firms are already fully automated. With little room for improvement, Japanese operations will continue to lose ground relative to their competition. Japan's Far East competitors, not content to sit on their labor-cost advantages, have been surprisingly aggressive in their efforts to improve quality through automation. "Everybody else is becoming automated. They're no longer unique," concludes Wasserman. "The delta between Japan and the rest of the world is becoming smaller." Although Japan's wage rates have been steadily creeping up on U.S. wage rates, the 160:1 yen-dollar equation actually makes Japanese labor slightly more expensive than U.S. labor, according to the Industrial Bank of Japan.

The Japanese have been working hard to offset the erosion of their manufacturing advantages by wringing further costs out of production. But Andrew Wei, division general manager with the Graphics Devices and Systems division of Seiko Instruments and Electronics Ltd.,believes that the potential for significant gains in what are already efficient manufacturing operations is shrinking. "With the cost structure," says Wei, "there's only so much you can do."

The most compelling evidence for the dilution of Japan's manufacturing superiority comes from the pragmatic business practices of the Japanese themselves. Just as the Asian upstarts have duplicated the Japanese economic master plan, Japan's actions now eerily parallel those of U.S. manufacturers. "We're seeing in Japan now what was happening in the U.S. 10 to 15 years ago," explains Yasuhiro Tsubota, president of Epson America. "Japanese companies are producing in Korea and Taiwan more than in the past. Manufacturing plants are moving offshore." The Japanese are also

The Japanese have begun to hit the wall of diminishing returns in their own cost-reduction efforts

buying more from their Asian rivals. Hitachi's procurement of materials offshore increased by 16% (to $868 million) in the fiscal year ending March 31. Overall, Japanese imports from Hong Kong, Korea, Singapore and Taiwan were up by roughly 20% in the early months of 1986. Imports of manufactured goods from Korea actually rose by more than 33% in the first quarter of 1986 (as compared to the first quarter of 1985).

The Japanese counterattack

With their business tactics under fire, their pricing advantage evaporating and their most strategic competitive advantage in dilution, the Japanese have not been twiddling their thumbs. Their efforts at moving some

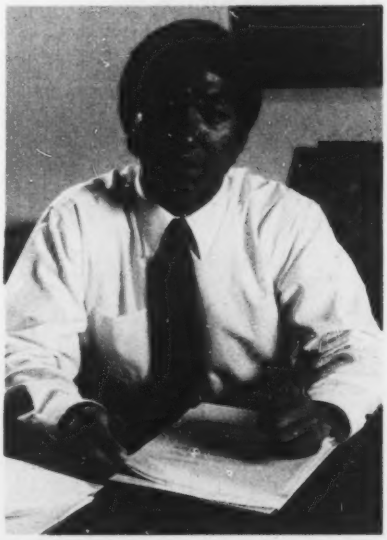
Howard Rosenberg

of their own production offshore and their sourcing of some finished goods and raw materials (one advantage of the yen's strength is the falling price of imports into Japan) are part of their more immediate response. They have also accelerated their investments in U.S. manufacturing, hoping to damp American resentment and bypass foreign import duties. Matsushita, for example, now has U.S. production facilities for color televisions, car audio systems and VCRs. The Japanese, moreover, now have a 50%, or more, stake in 405 U.S. manufacturing and assembly companies, according to the Japan Economic Institute. External component sourcing, foreign production and stringent cost reduction programs are all intended to help the Japanese hold the line on pricing to retain export market share. But Japan does not appear to be betting its future on restoring its competitive advantages of the past.

Actually, the Japanese have something quite different in mind. Japanese executives, when pressed on the subject of Far East competition, rarely stress their ability to regain control of commodity markets. What they emphasize is their ability to compete at the "high-end," the "value-added" sector, the "leading edge." It is interesting, for example, to hear Sho Nakanoma, president of NEC Electronics Inc., discuss the threat of Koreans in semiconductors. "I think it's possible the Koreans could become the dominant world supplier of commodity memories," Nakanoma concedes. "But the market needs more sophisticated products rather than commodity products." For U.S. semiconductor leaders who abandoned commodity memories to concentrate on the most technologically sophisticated devices, those must be chilling words.

The Japanese thrust toward technology leadership should come as no surprise. Even as many observers have continued to question their ability to innovate, the Japanese have been investing the booty of their export conquests in technology development.

From 1978 to 1983, the top 20 Japanese corporations increased their research and development budgets at a more than 20% annual rate, according to George Stalk Jr., a vice president and director of the Boston Consulting Group, who has studied Japanese industry. Japan's acceleration of R&D spending is even more impressive when that country's low inflation rate is factored in. Adjusted for inflation, Japan's R&D spending still grew at more than 17% a year in real terms: a doubling of expenditures over that period. As a percentage of gross national product, Japan's civilian R&D has almost doubled since 1960, now standing at roughly 2.5%. Total U.S. R&D spending, meanwhile, has inched along and now stands at roughly 1.6%.



SEIKO's WEI sees Japanese consumer electronics giants moving into industrial and business markets

The returns on Japan's investment in R&D are now becoming apparent.

At the very moment that American electronics manufacturers face an unprecedented opportunity, they also stand at the point of maximum danger

Last year both Hitachi and Toshiba surpassed IBM in the number of U.S. patent awards. Of all U.S. firms, only General Electric (778 patents) managed to stay ahead of Hitachi (693) and Toshiba (662) in new awards. Canon and Fuji Photo Films also earned enough patents to give Japan four of the top 10 U.S. patent grantees.

Bereft of low-cost manufacturing preeminence, Japanese manufacturers understand that they now must become leaders in value-added quality products and in services based on information technologies. "The pressures on the Japanese companies are more intense than ever to push in the direction of taking the technological lead because the alternative for them is to try to sell cheap with an expensive yen. And that isn't viable," explains Stalk.

The shift may well mean more than the emphasis of an NEC, let's say, on nibble mode or video random access memories as opposed to simply standard 256k × 1 commodity items. Potentially more threatening is the shift in focus of Japanese consumer electronics powerhouses that, until now, generally have steered clear of semiconductors, computers, production equipment and office machines.

In 1985, Japanese consumer electronics production, once a steady double-digit gainer, grew just 4%. Consumer elctronics, moreover, is the ultimate export industry, with roughly 70% of output sold abroad. With such heavy currency exposure and with new low-cost competition making rapid gains, Matsushita, Seiko and Sony Corp. and other wizards of consumer gadgetry are understandably eyeing new, more specialized markets. "It's very possible that we may actually be witnessing the early stages of a reorientation of some of the Japanese consumer electronics industry companies into more industrial-type and business-type applications of technology," observes Seiko's Wei.

Wei explains that for Japanese makers of consumer products besieged by lower cost competitors, simply increasing technology content may not be enough. As the home computer industry will attest, technology is no guarantee of broad-based consumer appeal. With Japanese consumer powerhouses beginning to eye the office and industrial markets long dominated by U.S. equipment manufacturers, even companies relatively free, until now, of foreign competition may begin to hear footsteps.

For U.S. firms, the implications of such radical shifts in Japanese planning are enormous. Because at the very moment that American electronics manufacturers face an unprecedented opportunity, they also stand at the point of maximum danger. The Japanese realize that they can no longer support their operations through unchallenged monopoly positions in commodity markets. Their mighty manufacturing apparatus, nonetheless, must be kept busy. The Japanese must move up. They have been planning for it all along. And it is American firms that stand in their way. □

Lianne Eidelis

NEWS ANALYSIS

Opportunity knocks: A chance for U.S. high tech

The same aggressive financial policies that underlie Japan's success can now aid many U.S. companies

By Norm Alster

The problem for Japanese exporters comes down to this: How can they respond to current business conditions without sacrificing profitability, market share or investment? The appreciation of the yen puts upward pressure on the prices of Japanese exports at the very moment that the Japanese face furious competition from low-priced Asian competitors. If the Japanese do not cut prices, they will lose business and market share. If they do cut prices, their traditionally thin profit margins will be under extraordinary pressure. In either event, whether they choose to sacrifice sales or margins, the Japanese face pressure to cut back on their budgets; particularly capital spending, and research and development.

The problem for U.S. electronics firms comes down to this: With their Japanese rivals both compelled and determined to confront them head-to-head in technology leadership, how can American firms best exploit Japan's current problems?

Surely, there is no single answer for all companies in the U.S. electronics industry. Firms of differing sizes and strengths in diverse industry sectors face different levels of Japanese competition in markets with varying growth rates and pricing environments. However, many U.S. firms facing Japanese competition are now in excellent positions to avail themselves of one of the prime competitive tools of their Far East rivals.

It is remarkable, really, that with so much attention devoted to documenting and emulating everything Japanese, little attention has been focused on the fundamental financial practices of Japanese corporations. And yet there is reason to believe that the same aggressive financial policies that underlie Japanese industrial success could now enable many American firms to turn back their foes. U.S. firms hoping to take advantage of current conditions would do well to consider some combination of the following practices:

- Aggressive pricing to regain or win new market share
- Accelerated and, in some instances, unprecedented spending on research and development and capital improvements to secure long-term cost and technological advantages
- Rapid accumulation of cash to support such efforts through more aggressive borrowing and/or dividend cuts.

This has been the Japanese program. Now, with the Japanese facing a unique array of serious threats, many of these companies are stretching thin and will, increasingly, be forced to cut back on the aggressive investment and pricing policies they favor. U.S. firms able and willing to sacrifice some near-term profitability for market share expansion at the expense of hamstrung Japanese challengers can benefit most from more aggressive financial policies.

David Biedrzycki

"What people underestimate is the effect of aggressive financial policies on the ability to sustain growth or even produce growth that's faster than your competitors'," argues George Stalk Jr., a vice president and director of the Boston Consulting Group and co-author of *Kaisha*, a study of the Japanese corporation. "All else being equal the levered company is going to be able to grow faster than the unlevered company. And the consequence of that is that the levered company is going to be able to drive down its production costs faster. . . . The levered company which started out in the poor profitability position ends up, because of its growth and its improved competitive position, as the more profitable company."

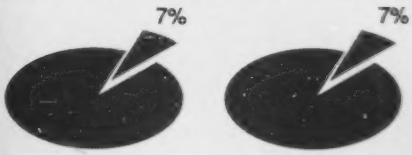
"With a higher degree of leverage financing and a higher rate of growth, a company is able to ride down the experience curve faster and thereby drop prices," agrees Steven Schlossstein, manager of Japanese institutional sales for Vickers da Costa, an

Why Japanese companies can grow almost twice as fast as U.S. and European companies

Japanese electronics firms have demonstrated the ability to grow faster than most of their U.S. and European rivals. To understand why, the Asian Advisory Service, a Tokyo-based consultanting group, studied the financial structures and performance of two groups of electronics companies in the 1983-1984 time period. The following chart explain why the Japanese companies have an average sustainable growth rate (the ability to grow assets without changing capital structure or dividend payout) roughly twice that of the U.S.-Europe group.

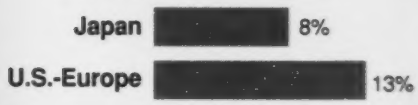
1. It is not because the earnings of Japanese companies are higher

Pretax, pre-interest earnings as a percentage of sales



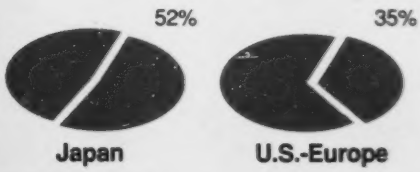
2. Although Japanese companies can borrow money at lower rates...

Average interest rates on debt



3. ...this advantage is offset by higher tax burdens

Taxes as a percentage of pretax income



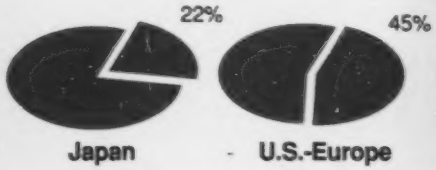
Study groups:

Japanese companies: Fujitsu Ltd., Hitachi Ltd., Matsushita Electric Industrial Co. and Toshiba Corp.

U.S. and European companies: General Electric Co., IBM, N.V. Philips GL and RCA Corp.

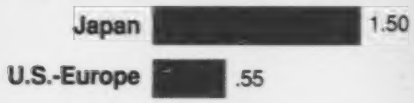
4. The reason is that U.S. and European companies pay out more in dividends

Dividends paid out to shareholders as a percentage of net income



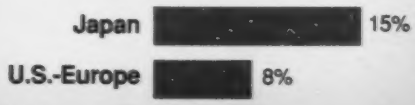
5. The money saved in dividend payouts is then combined with much higher levels of borrowed cash

Long- and short-term debt to equity ratio



6. The money is used to subsidize the pricing advantages and high levels of capital investment that afford higher sustainable growth rates

Rate at which companies can expand assets without altering debt equity or dividend payout ratios



investment banking firm, and the author of *Trade War*, an analysis of U.S. and Japanese economic policies.

The use of more aggressive financial policies is sure to be a controversial issue. Companies struggling to break even will be understandably reluctant to take on new fixed costs. But aggressive financial policies should not be seen as the defensive last resort of the financially weak firm. More likely, beneficiaries of such tactics are companies with strong balance sheets that would like to grow at the expense of a larger competitor, or those that need to stave off a smaller but more financially aggressive rival.

It is understandable that U.S. electronics industry leaders, many of which achieved significant market share and size without significant Japanese challengers, have kept their debt low. But debt formulas that are appropriate in tame competitive environments can become a burdensome disadvantage for firms targeted by the Japanese. Financial conservatism makes a large firm an easy target for the financially aggressive challenger, according to Stalk. Japanese companies have typically used leveraging to grow at the expense of larger, more established U.S. competitors. The average debt to equity ratios for U.S. manufacturers, says Stalk, is 0.6:1. The average Japanese manufacturer maintains a 1.6:1 debt to equity ratio. U.S. semiconductor companies, for example, maintain debt to equity ratios that only rarely approach 0.5:1. But NEC Corp., which recently overtook Motorola and Texas Instruments as the leading worldwide merchant supplier, has been fueled by high-power debt to equity ratios as rich, in recent years, as 4:1.

Japanese companies have traditionally taken on high levels of debt to finance market share expansion in high-growth markets. "The name of the game is cash: cash I can earn for myself and cash I can borrow and what I can do with the combination," says Stalk. By borrowing more, Japanese companies can increase R&D expenditures more rapidly and add plant capacity more rapidly. With greater production capacity, they can focus on wresting market share. Success in this, in turn, drives down pro-

Could your firm benefit from leveraging?

Increased debt is not for everyone. Companies with strong balance sheets can more easily expand debt without significant credit rating changes and without offering concessions or losing management control to bankers. Firms with pedestrian technology, undistinguished product and weak marketing plans will not be miraculously transformed into unstoppable engines of growth.

How can you tell if your company would benefit from more aggressive financial policies? George Stalk Jr., a vice president and director of the Boston Consulting Group and an advocate of aggressive financial policies, says executives can begin by asking themselves the following questions:

"Are you facing a competitor that is substantially bigger or smaller than you are? If so, do you have very different financial ratios; by that, I mean dividend ratios, leverage ratios, interest rates and taxes?"

If your competitor is smaller than you but is growing faster and has more aggressive financial policies or, alternatively, if your competitor is much larger than you and has very conservative financial policies, then it may be time to reconsider your own financial assumptions.

If, says Stalk, you are a small firm competing against a large conservative firm you are in the classic situation to benefit from leveraging. Like the Japanese firms that targeted the giant American and European market leaders, you can use debt to finance pricing advantages. If, moreover, you are in a growth market, you can leverage to expand at a rate equal or better than the overall market.

Large diversified companies facing smaller, more aggressive, growth-minded challengers can also benefit from more aggressive financial policies. The larger company will not generally face a small aggressive competitor across all of its product lines. Most likely, the smaller company is growing at the expense of a division or product line within the large firm. The problems of divisions within large companies can often be traced, Stalk contends, to corporate formulas such as "hurdle rates." Essentially, a hurdle rate requires a proposed investment to exceed a certain rate of return. If, therefore, a division cannot justify a new plant or sales office by exceeding this corporate-wide requirement, then it is not likely to get the funds. The problem, says Stalk, is that hurdle rates are uniform and, as such, ignore the realities of competition: the hurdle rate, for example, might be the same whether "they're in janitorial services or making microprocessors." But that microprocessor division may have a well-financed, start-up competitor willing to invest for market share growth with a lower guaranteed rate of return. "The poor guy in the division within the diversified company has to clear a hurdle rate that is too high to compete with someone that has a lower hurdle rate."

> Faster growth markets readily reward increased investment since they can better absorb added capacity

Company-wide financial guidelines may make sense to accountants but they mean trouble for large companies with divisions in competitive international industries. "The single greatest handicap American managemnt has is that they average everything," Stalk concludes. Instead of investing by formula, he argues, they should be investing in response to competitive circumstances.

Aggressive financial policies can work in both high and low growth markets. But, says Stalk: "The power of the policies to affect relative competitive position becomes much more pronounced in faster growth markets. Faster growth markets mean that you need more cash relative to the assets you have." Such markets readily reward increased investment since they can better absorb added capacity. Slower growth markets may require price cutting (which can be funded by added debt) to expand market share. □

duction costs. Meanwhile, with the enhanced cash flow from borrowings, they can subsidize price cuts.

The financially aggressive firm has market share as its objective. It uses borrowed cash, not profits, to grow. And what it earns, it plows back into investment, paying very low dividends. Schlossstein of Vickers da Costa, summarizes the different financial outlooks of U.S. and Japanese companies. "American companies will sacrifice growth to preserve high profits. Japanese companies will sacrifice short-term profits in order to capitalize on growth."

A recent study by James C. Abegglen, co-author of *Kaisha* and president of the Asia Advisory Service, a Tokyo-based consultancy, analyzed the impact of differing financial policies on the long-term growth capabilities of two groups of major electronics manufacturers. One group consisted of seven U.S. and European firms: General Electric Co., IBM, N.V. Philips' GL, RCA Corp., Siemens AG, Texas Instruments Inc. and Westinghouse Electric Corp. The Japanese group consisted of Fujitsu Ltd., Hitachi Ltd., Matsushita Elecric Industrial Company Ltd., Mitsubishi Electric Corp., NEC Corp., Sony Corp. and Toshiba Corp.

Abegglen found that the Japanese companies had sustainable growth rates (defined as the rate at which a company can grow assets without changing its debt, equity or dividend payout ratios) almost twice as high as the U.S.-Europe group: 15% as compared to 8%. Abegglen analyzed the reasons for the superior Japanese growth capability. He found, interestingly, that the groups performed with equal efficiency in pre-interest, pretax, predividend earnings as a percentage of sales: in the 1983-1984 period on which the study is based, each earned 7% of sales before allowance for interest payments, taxes and dividends.

The Japanese, of course, were carrying far heavier debt: on average, 1.5 total debt to equity as compared to .55 for the U.S.-Europe group. The conventional explanation would be that the Japanese can carry more debt because they can borrow at lower interest rates. This advantage in lower capital costs, therefore, would allow them to borrow more and grow faster without incurring high yearly interest payments.

Some of this is true. The Japanese did have lower costs of capital: an average effective interest rate of 8% versus 13% for their Western competitors. However, these lower costs were offset by their much higher tax rates. While the Western firms paid out an average of 35% of pretax income, the Japanese companies paid out 52%. Higher taxes and lower interest rates balanced out. What then accounted for the difference in growth capabilities? Part of the answer lies in the higher levels of cash available (from borrowings) to the Japanese for investment and for price-cut subsidization. The other major factor is dividend payout. Japanese firms paid just 22% of their profits in dividends but the U.S.-Europe group paid out 45%.

SIDNEY WEBB: "Bucking the financial community doesn't help a CEO's career or his stock options"

> "I think most companies are afraid to get too leveraged for fear they will be criticized on Wall Street"
>
> Sidney Webb

These figures belie the common impression that U.S. electronics firms pay low dividends. In some cases, of course, this is true. But in many other cases low dividend yield is confused with low payout. IBM, for example, pays a $4.40 dividend. This does not sound like much on a share price of, let's say, 135. The dividend yield of 3.25% is meager compared to the 10% and higher dividend yields of many utility and energy stocks. But IBM has 618 million outstanding shares. So IBM is actually paying out a king's ransom of $2.7 billion; roughly 41% of its $6.5 billion of 1985 net earnings. RCA paid out 60% of its earnings during the two-year period from 1983 to 1984. Fujitsu, Hitachi and Matsushita, meanwhile, were paying out less than 15% of their earnings in dividends.

It is the combination of retained and borrowed cash that allows companies to grow. The Japanese, by taking on debt and limiting dividend payouts, are therefore able to grow twice as fast as their competitors. While their lower cost of capital is a factor, according to Abegglen, it is offset by higher tax payments. The decisive factors are low dividend payments and higher debt levels. And the critical application for available cash is growth. "The Japanese companies are by and large more comfortable with high growth than their American counterparts," says Schlossstein, noting that the Japanese will generally opt for growth and market share over short-term profits.

Why the iron is hot

There are a number of reasons to believe that now is the time to derive maximum advantage from the financial strategy long employed by the Japanese. For one thing, with the U.S. prime rate below 8%, the Japanese advantage in lower capital costs has been substantially narrowed. It has been a decade since money was so cheap. The refinancing of existing debt — often incurred at rates of 10% to 16% — lowers the costs of debt servicing and in itself allows firms more flexibility in taking on new debt. The currency situation, moreover, has made Japanese exports more expensive. The Japanese continue to show the value that they place on market share. They are now taking hits in earnings to keep prices down and retain customers. Even so, Japanese firms are raising prices slowly (to date, by 10% to 15%, absorbing the rest of the 50% currency exchange penalty) and if the currency situation persists, they will be forced to go further or accept serious earnings consequences. Such pressures are already resulting in capital expenditure cutbacks. A recent survey by Japan's Economic Planning Agency forecasts a 4.6% drop in capital spending during the second half of this year, the largest cutback since 1980. *(Continued)*

Jim Caccavo

U.S. firms acting decisively now have the opportunity to apply capital in a variety of timely ways. "You might decide that in a given market or area that this is hurting the Japanese enough that now is the time to put the capital investment in, or some marketing effort, or to expand production or even cut prices," counsels Sidney Webb, a member of the board of directors of both Amdahl Corp. and Avnet Corp. and a consultant to several major Japanese electronic firms. Or, as T. Michael Nevens, a principal with McKinsey and Co. in Los Angeles, points out, a firm having to make a difficult choice between two competing research technologies could choose to hedge its bets and fund both.

At a time when the Japanese are finding it economically worthwhile to manufacture in the United States, American firms could take a cue from their rivals and modernize their domestic facilities. Says Stalk: "Instead of taking a chunk of business and going offshore, you may have the opportunity to offset a high-cost position through more aggressive financial policies. . . . If you say: 'OK, instead of going offshore I'm going to fix my factories and make them productive. I'm going to lever up like mad. I'm going to accept lower returns, supposedly. But I know I'll be able to generate more cash. Therefore, I'll be able to keep growing my way out of this problem.' There you have an argument for not going offshore."

Companies without sufficient cash flow might be reluctant to further depress their revenue stream through price cuts. But companies taking on debt would be able to subsidize such cuts and perhaps win the volume business and make the investments in added capacity that will bring down costs with time. Owen Robbins, vice president of finance for Teradyne Inc., has kept his firm's debt very low and is certainly not a proponent of high leverage. But he does allow that in markets which are price sensitive, higher debt would be an effective and reasonable tool for supporting more aggressive pricing. Schlossstein says that seizing the pricing advantage from the Japanese represents an enormous opportunity for U.S. firms to regain market share.

The downside

Why then, if there are such obvious benefits to more aggressive financing, do U.S. companies plod along with such conservative policies? Gary Arnold, chief financial officer for National Semiconductor Corp., says that firms in the semiconductor industry are constrained by the expectations of lenders and investors. "The markets in the U.S. just won't permit us those kinds of leverage numbers. The banks won't support it. The equity markets won't support that kind of leverage." Arnold says that a U.S. semiconductor firm increasing its debt to equity ratio to 1.1:1 would start attracting some concern. On the other hand, he says: "It's not atypical to see a major Japanese company with a total debt to equity [ratio] of 2.5 or 2.8." Asked if the ability of a Japanese company to take on more debt represented a disadvantage to its U.S. competitors, Arnold replied: "Clearly, it's a competitive disadvantage and it has been. That's nothing new."

NATIONAL SEMICONDUCTOR's ARNOLD says that firms in the semiconductor industry are constrained by the expectations of lenders and investors

> The company that sacrifices its future for quarterly earnings gains will realize the benefits of high stock valuation for only so long

If, indeed, this is the case it may be time to more closely examine the reason why U.S. firms would leave themselves at such a competitive disadvantage. The arguments against the use of higher debt levels to fund growth can be summarized as follows: The investment community has certain formulas for evaluating companies. Heavy debt adds to risk which will deflate the premium put on a company's share price. Heavy debt might also lower a company's credit rating, forcing it to borrow at higher interest rates. Heavy debt further functions as a drag on earnings since companies must take on higher levels of fixed interest payments. This would also tend to deflate share price, which is generally tied to earnings performance. Finally, the argument goes, borrowing does not make sense for U.S. firms since they must borrow at higher interest rates that the Japanese.

It is worth noting that most of these arguments revolve not around the inherent value of leveraging, but on the response of the investment community. Indeed, the issue raised again and again is that of stock price. "I think most companies are afraid to get too leveraged for fear they will be criticized on Wall Street," says Sidney Webb. But, is the fear justified? Is the penalty for leverage as steep as the penalty for "prudent" inaction?

McKinsey's Nevens explains that according to classical market theory a leveraged company would have more volatile earnings performance and, as a consequence, more volatile share price fluctuations. But Nevens has recently undertaken an investigation of that assumption. His preliminary observations suggest that some industries carry higher debt on average than the electronics industry without paying any penalty of share price volatility. If this is the case — and Nevens has not yet reached a definitive conclusion — then it would mean that some electronics companies would indeed have room to increase debt without incurring a market penalty.

But really, the whole notion of operating a company with an eye to how the stock market might react is just a cut or two above the employment of astrologers as management consultants. For one thing, the market tends to move in broad sweeps. In serious downturns, 90% of all stocks go down. Imagine keeping the lid on needed capital improvements and R&D to bolster share price only to have the market enter a steep downturn. Not only does your company's stock fall with the rest (perhaps not quite so steeply) but when the market turns around your competitive position has

Lianne Entelis

been eroded, most likely by rivals who made the tough decisions you avoided.

The company that sacrifices its future for quarterly earnings gains will realize the benefits of high stock valuation for only so long. And sure, the stock of a company that halves its earnings forecast will take an immediate hit. But an efficient market will eventually recognize long-term value beyond near-term earnings shortfalls. Even if the stock shows relative weakness for months, once the well-conceived program begins to show benefits it will outperform its competitors, whose competitive strength by then will have begun to erode.

Two notable examples: DEC and IBM. Digital Equipment Corp. was a relatively weak performer on Wall Street in 1983 and 1984, as analysts focused on its poor financial performance. But DEC, which pays no dividends, was spending more than any of its rivals (excepting IBM) on capital expenditures and R&D during the early 1980s [ELECTRONIC BUSINESS, January 1, 1986 p40]. DEC's $2.5 billion R&D investment (1981-1985) began to bear fruit last year as the company managed to completely overhaul its product line. DEC's stock has doubled, rising close to 100 points before a two for one split.

IBM, a company with almost negligible debt, suddenly began to borrow heavily in 1979. Almost overnight, it increased its debt sixfold, raising its debt to asset ratio above 30% for the first time in 15 years. Although there was some institutional flight from the stock and IBM shares performed poorly in the early 80s, the company would make a lot of money for anyone who bought it in 1982. That is because IBM was spending in early recognition of a manufacturing threat from Japan. The company's efforts to solidify its manufacturing base were expensive, but they were farsighted and the company's share price, once the advantages of that investment were recognized, has tripled since mid-1982.

Critics of leveraging will say that DEC and IBM are unique. IBM has unparalleled cash flow and market leadership. DEC has a unusually powerful chief executive (Kenneth Olsen) capable of leading the company where mere managers would fear to tread.

But really, DEC and IBM are perfect examples of the types of companies that can best make use of aggressive financial policies. Strong companies with strong balance sheets recognizing looming threats are more likely to benefit from such tactics than weak companies with weak technology and product. All too often debt is taken on only after the damage has been done. The firms that face rude awakenings are often those with the well-manicured balance sheets; the ones lullabied into sweet dreams by the reassuring rhythm of carefully orchestrated quarterly earnings gains.

Wasserman of Arthur D. Little suggests that the pressures for financial performance often overwhelm executives of American firms. "They are acting under the assumption that there are certain expectations within the financial community. If they don't perform, they'll be fired," he says. Webb, who has been both a board member and chief executive of major U.S. companies as well as a joint venture partner with the Japanese (TRW-Fujitsu), goes further in explaining executive's motivation. "Bucking the financial community doesn't help a CEO's career or his stock options," he observes wryly. The Japanese, it turns out, are free of such confusing pressures on decision making. "They don't have stock options for executives in the Japanese industries so they are not focusing on the short-term movement of the company's stock. I think that allows them perhaps to take a longer term view."

Because it is so difficult for an individual executive to convince Wall Street of the merits of aggressive financial policies, Webb suggests a cooperative industry-wide campaign: "My guess would be that the best thing U.S. industry could do would be to educate Wall Street and the investment bankers and try to get them to view the industry and stocks in a little different manner," says Webb. Chief financial officers could catalyze the process by re examining some of the sacred financial ratios.

But do American electronics firms really have the time to wait for such a movement to get started? The debates alone could last for years. Courageous and farsighted chief executives will simply have to move on their own. For the American company already lined up in the sights of a Matsushita, Seiko or Sony, as it targets business and industrial applications, time is mercilessly short. □

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ISDN: The network everybody is tuned to

Integrated services digital network is attracting a big audience — from chip suppliers to CO-switch vendors

By Carol Suby

In the quest to bring about a universal integrated services digital network (ISDN), component suppliers, equipment manufacturers and potential ISDN service providers are proceeding with caution.

The concept of ISDN — where the simultaneous transmission of voice, data and video over simple twisted-pair telephone wires — has been a ray of hope for a downcast communications industry. Most of its traditional segments have come under extreme profit pressure, so the prospect of a new business with new revenue opportunities has lifted the industry's spirits. Early ISDN entrants, however, will need deep pockets since significant financial returns are not expected until the end of this decade.

Since ISDN is a network and not a specific product, its value can only be measured by its impact on existing products or new components and equipment designed specifically for the network. The first year that vendors can expect to benefit financially from ISDN is 1988, says Dataquest Inc., when $455 million will be generated by the implementation of the network. In 1990, the San Jose, Calif., market research firm predicts that ISDN revenue will reach $2.6 billion — with $1.2 billion coming from equipment sales and the rest from transmission fees.

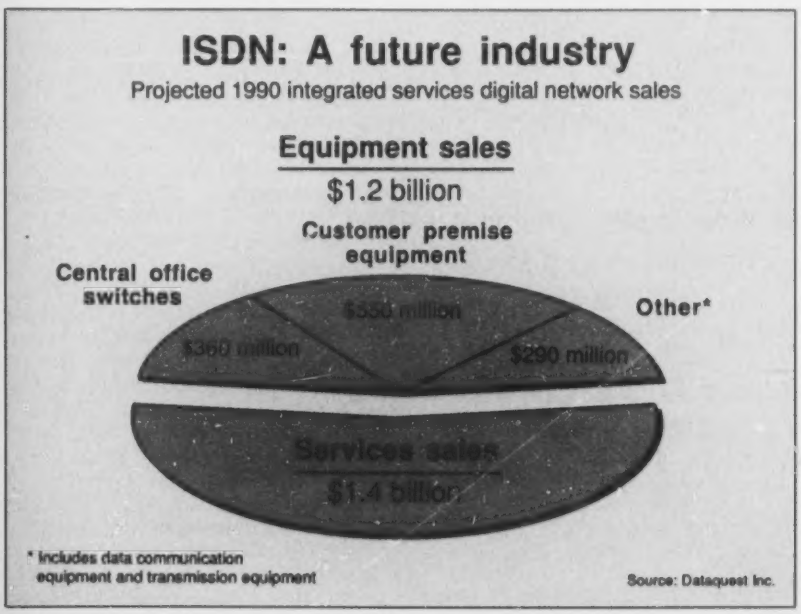
Manufacturers of customer premises equipment (CPE) will benefit most from the advent of ISDN, believes Victor Krueger, Dataquest's vice president of telecommunications industry services. In 1990, the network will add another $550 million to CPE vendors' coffers. By then, ISDN also is expected to boost sales of central office (CO) switches by $360 million and transmission/data communications equipment by $290 million.

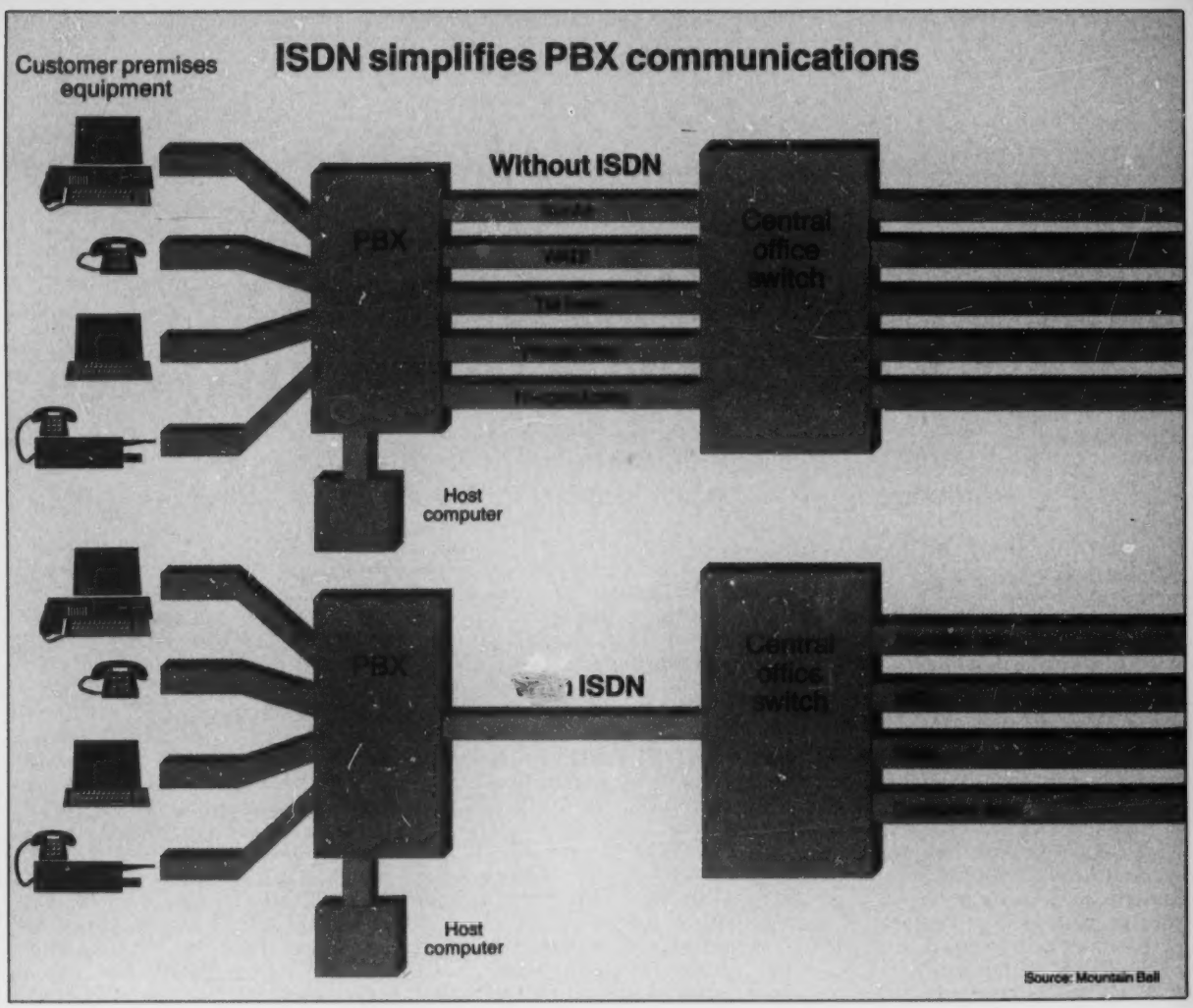
ISDN suppliers and customers share Krueger's view that significant business opportunities will be created by the network. "The connecting chip between the user and the switch will be the winner," predicts Helmut Schwab, president of Siemens Components Inc. The "hottest selling product" will be digital telephones, says James Bendel, district manager of ISDN operations and terminal interface planning at Illinois Bell, one of the many telephone companies experimenting with ISDN service.

Smoke or fire?

Despite the reams of press articles, the deluge of seminars and the mass of ISDN product announcements, "there's a lot less action than the talk would lead you to [believe]," says Joseph G. Schatz of Arthur D. Little Inc., a Cambridge, Mass., management consulting firm. The industry-wide impression that ISDN is ready for take-off is quite different from the reality, according to an ADL study completed in mid-1986. Lack of standards is delaying some product development, end-users are still in the dark and the telephone companies are far from ready to offer complete ISDN services.

Nevertheless, "ISDN is a real and tangible market and [at the same time] a lot of smoke," in the words of Sean White, president of Northern Business Information Inc., a market research firm in New York City. "[Certain] services that will be provided by local telephone and long-distance companies are very real and





are developing very quickly," says White. "But, if you're talking about everything ISDN was ever imagined to be, that's more marketing hype than reality."

The market researcher is referring to two services, known as 2B+D and 23B+D. Their names indicate the way that information is transmitted by each service. The basic rate, or 2B+D interface, is a facility provided by an ISDN network capable of transmissions over two B channels — carrying voice and data — at 64 kilobits per second (Kbps) and one D channel — carrying signalling information — at 16 Kbps for a total capacity of 144 Kbps. This type of service will generally be offered as a part of Centrex, which is a combination of services offered to businesses and generated by a CO switch.

The primary rate, or 23B+D interface, is a facility provided by the ISDN network capable of transmissions over 23 B channels and one D channel each at 64 Kbps for a total capacity of 1.544 megabits per second. This service will be provided by both local telephone companies as well as interexchange carriers such as AT&T, MCI and US Sprint and will generally go to large business users that have their own private branch exchanges (PBXs).

What exists from a hardware standpoint are a handful of chips, that are mostly in the development to sample stages; central office switches capable of some, but not all, ISDN functions; and CPE such as digital telephone sets, desktop terminals and PBXs that are close to being ready for ISDN trials scheduled for later this year and throughout next year.

> The industry-wide impression that ISDN is ready for take-off is quite different from the reality

Rather than a single ISDN chip that will bring the universal network to life, there will be numerous ISDN integrated circuits. Each will serve particular functions within the network. Although chip manufacturers have been announcing ISDN products throughout the year, most have not gone beyond the prototype stage. And, many of these chips are being tested in CPE, or terminal equipment, such as digital telephone sets, integrated voice/data terminals, desktop computers and facsimile machines.

"Everybody's still at the starting gate," says Lynn Ditty, product manager of devices at AT&T Technology Systems, headquartered in Berkeley Heights, N.J. Customers have had a couple of months to look over AT&T's ISDN chip entry, dubbed UNITE, which was introduced in July. It is being sampled internally by AT&T's equipment divisions and externally by others. Full production of the UNITE chip is expected to begin in early 1987 at AT&T's Allentown, Pa., semiconductor production plant.

UNITE is a very large scale inte-

grated (VLSI) complementary metal-oxide semiconductor (CMOS) that allows for the integration of voice and data transmissions. Like the majority of ISDN chips being introduced, UNITE adheres to the basic rate, or 2B+D, interface standards set by the International Telegraph and Telephone Consultative Committee. (CCITT is an international committee based in Geneva, Switzerland, that is setting the standards for this universal network.) The preponderance of ISDN trials scheduled in the near future will use basic rate services.

Getting a head start

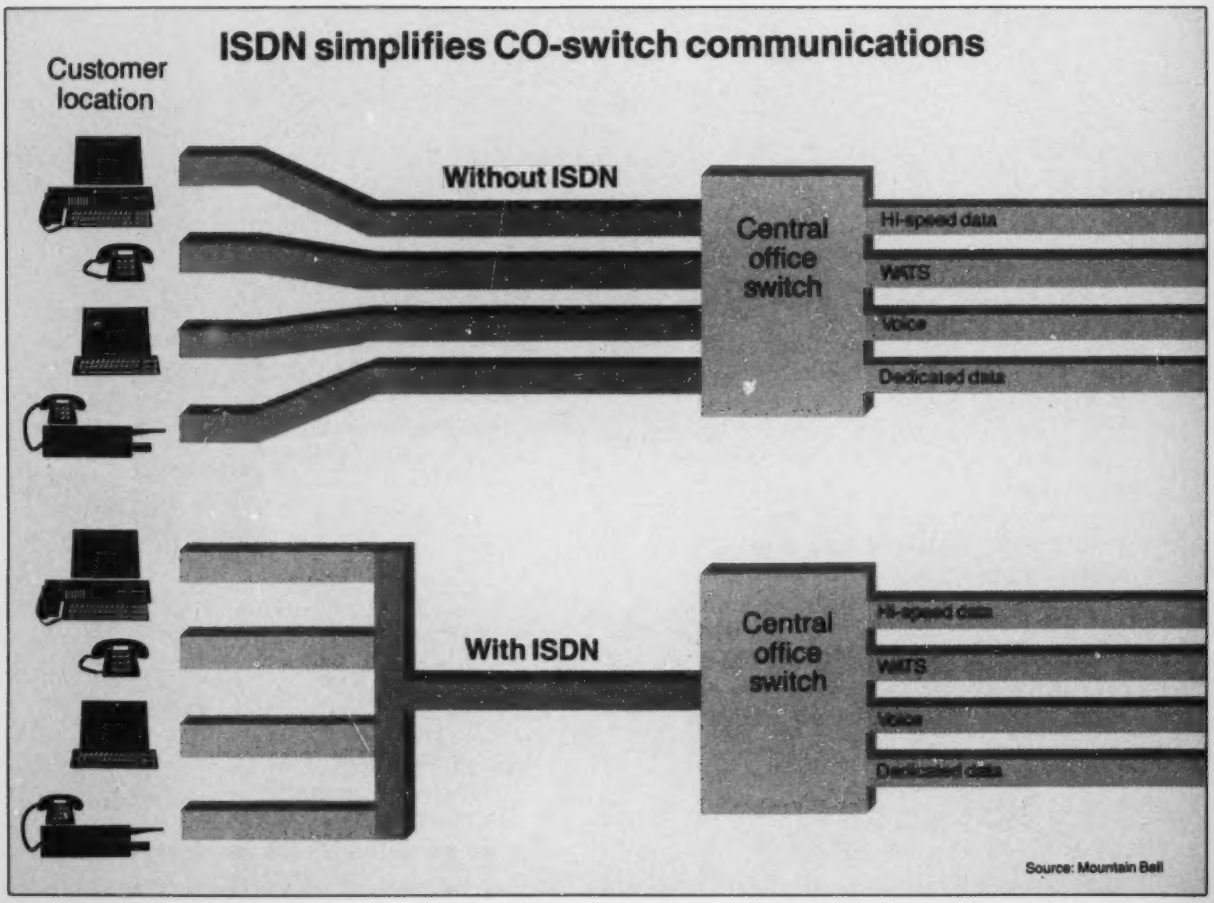
One of the first companies to announce an ISDN family of chips in the United States was Siemens Components Inc. of Iselin, N.J., a subsidiary of Siemens AG, Munich, West Germany. Siemens, which introduced the chip family to the United States in February, got its head start from its entrenchment in the European marketplace, where some standards are more defined than in the United States.

Another company advantage, asserts Helmut Schwab, president of Siemens Components, has been the expertise gained by its close association with another Siemens subsidiary that manufactures communication equipment. Although some equipment manufacturers have concerns regarding buying chips from a vendor whose components are vertically integrated into competing systems, Schwab points out that 80% of his current sales come from the merchant marketplace. As a result, he says, the outside customer is given priority.

Advanced Micro Devices Inc. (AMD), headquartered in Sunnyvale, Calif., is attacking the communication chip market in a big way. Its family of ISDN chips are an important component in the company's strategy to become the No. 1 telecommunication IC manufacturer by 1990. Of the four ISDN chips that AMD has introduced so far, two are designed to be incorporated into terminal equipment and the other two are for use in PBXs or CO switches; all four will be incorporated at the basic rate interface level of an ISDN network.

One way AMD aims to differentiate itself from other ISDN chip vendors is to pack as much capability into its components as possible, says Ronald Ruebusch, director of strategic marketing at AMD's Communications Products Division in Austin, Texas. For example, its Am79C30 (a CMOS, VLSI chip) will perform all the necessary functions that are required at first layer, meaning the physical layer of the Open Systems Interconnect (OSI) reference model — a standard for interconnecting computer and communication equipment. Other vendors, Ruebusch points out, require a set of three to five components to perform the same functions.

Ruebusch expects that initial applications for AMD's ISDN chips will be in terminal equipment from manufacturers such as AT&T, Digital Equipment Corp., NEC Corp. and Wang Laboratories Inc., which are likely to offer ISDN capability with many of their products. In addition to the systems manufacturers, the AMD executive sees a great opportunity in sup-



plying ISDN chips to companies that build plug-in cards for personal computers. Such cards, he believes, will be a significant market for ISDN components early on.

Like Siemens' Schwab, AMD's Ruebusch does not expect to see significant volume production for any products, including components, for another three to four years. However, by the year 2000, he predicts, "the ISDN market will be the largest market for communication ICs."

The ISDN approach at Intel Corp. of Santa Clara, Calif., is a bit different than other IC vendors. Not only is the company offering ISDN chips, it is also developing software that will address several of the seven layers of the OSI model. "The standards established today cover more than the physical layer [layer one of the OSI model], which involves silicon," says Jagtinder Bolaria, ISDN product manager at Intel's Chandler, Ariz., facility. As a result, Intel has chosen to also address levels two and three, where additional standards have been set and where software plays a significant role. Beginning next year, Intel will have software product offerings to address these levels.

Foreign invasion

"Central office switches are the brains and the heart of the public telephone network," says Ronald Weindruch, vice president of sales at Siemens Communications Systems Inc., based in Boca Raton, Fla. These mammoth switches, employed most often by communication carriers to route local and long-distance calls, will act as the hub for the majority of ISDN services in the future.

This major role is a source of comfort for established CO-switch suppliers in the U.S. market. AT&T and Northern Telecom Ltd., the dominant CO-switch companies, face a declining market for the products they now offer. Northern Business Information Inc. predicts that the number of digital CO-switch lines installed annually in the United States will drop more than 10% this year from last year's record of 12 million lines. So AT&T and Northern Telecom are overjoyed at the prospect of a new technology, spurring demand for their products and allowing them to add features that will increase their profitability.

At the same time that their market is shrinking, a number of other CO-switch manufacturers are using ISDN capabilities to break into it. Ericsson Inc., NEC and Siemens all have switches scheduled for ISDN trials to be run by Bell operating companies (BOCs) throughout 1987. The major battle lines, however, are being drawn not so much against the two presiding giants but against those whose market share ranges from very little to nothing. GTE Corp., the No. 3, U.S. CO-switch supplier, would appear to be vulnerable except that most of its switch sales are to its own telephone companies.

AMD's RONALD RUEBUSCH: By the year 2000, he predicts, "the ISDN market will be the largest market for communication ICs"

"All of the telephone companies across the country want at least the possibility of a third supplier . . . to increase competition in price, capabilities and services," suggests Weindruch of Siemens. "But a third vendor will have to get at least 10% of the market for the major players to pay any attention to [that] vendor." Consequently, Weindruch points out, "Our competition over the next few years is not Northern Telecom or AT&T, [but] others trying to be third."

Siemens is making some inroads with its EWSD switch. Having some form of agreement with a majority of the seven regional holding companies (RHCs) — contracts and purchase orders with BellSouth Corp. and Ameritech; letters of intent from Nynex Corp. and Bell Atlantic Corp.; and possibly another letter soon from Southwestern Bell — the wheels are in motion for future sales. Nevertheless, the first EWSD switch shipments are not scheduled to take place until next year, leaving Siemens for now without market share. Undaunted by such an uphill climb, Weindruch believes Siemens has an edge. The EWSD switch, he claims, has been designed with ISDN in mind so upgrading it will simply require, he claims, adding a line card into the switch. "For us," he says, "[upgrading our switch to ISDN] is a yawn."

Ericsson, the Richardson, Texas-based subsidiary of Sweden's L.M. Ericsson Telephone Co., has switch trials scheduled to take place at Southwestern Bell, U.S. West Inc. and Nynex over the next year. In addition to providing its AXE digital CO switch, Ericsson has ISDN product offerings that extend beyond the CO switch to CPE which will play a feature role in ISDN's implementation, including digital telephone sets, the end of the line for ISDN; terminal adaptors, integral in adapting non-ISDN CPE to the network; and PBXs, switchboards located on the customer's premises.

Regardless of the lack of U.S. market share for both Siemens and Ericsson, "we are already paying attention to [these companies]," says Jerald L. Johnson, manager of product planning for digital switching equipment at AT&T Network Systems' Software Center in Lisle, Ill. Both companies are very successful internationally, Johnson points out, and AT&T is not ignoring them.

Like all other CO switch manufacturers, AT&T is using ISDN capabilities as a marketing strategy. It is working, Johnson says, because the BOCs — the chief customers for AT&T's 5ESS CO switch — are basing their purchasing decisions on a vendor's ability to provide for future switching needs. Upgrading a 5ESS to ISDN is a matter of adding two pieces of hardware — a packet switch unit and an integrated service line unit, both inserted into the switch — and a software package that is still in development.

Northern Telecom's claim to fame in the ISDN switch race is that its DMS-100 product is the most feature-rich of all CO switches, claims John Chattoe, vice president of ISDN at Northern Telecom's Toronto location. "No other [vendor] can offer the voice and data features that we do," Chattoe boasts. The cost of such progress, he adds, has been high — eating up a large portion of the comany's research and development budget,

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which this year will represent about 10% of total sales.

Although each of the seven RHCs and their 22 affiliated BOCs are anxious to get their feet wet with ISDN, none is spending heavily on ISDN-related capital equipment purchases. "My job is to try to minimize the amount of money we need to lay out for ISDN," says Wayne Heinmiller, manager of ISDN planning at Ameritech Services in Schaumburg, Ill.

Ameritech is currently spending $1 billion this year converting to digital equipment and installing fiber-optic cable, yet its biggest concern when purchasing a digital CO switch is whether it can provide Centrex services. "ISDN is listed under future needs," he adds, and if a switch is not ISDN capable, that does not mean it will not be purchased. "We service some areas that may never need ISDN," he says.

If customers start banging on Ameritech's doors for ISDN services then that could motivate the company to replace its switches faster than planned. But the company does not expect such demand. "Everyone's talking ISDN," says Heinmiller, "but when you sit with customers, they're rather baffled. There's nothing for them to put their hands on and play with."

Customer confusion is the major impetus behind the ISDN field trials that have been scheduled by each of the RHC's to take place at a number of BOC locations. One of the most extensive trials is scheduled to begin this quarter between Ameritech's Illinois Bell Telephone Company, headquartered in Chicago, Ill., and McDonald's Corp. headquartered in Oakbrook, Ill.

"McDonald's [trial] requires terminal gear for everything under the sun from telephones to computer terminals," says Heinmiller. The AT&T 5ESS central office switch is just one piece of myriad equipment that will be used in this trial. The rest of the equipment is being directly supplied by the CPE vendors themselves. Fujitsu Ltd. and NEC already have announced their involvement in the trial, which is expected to involve several other vendors as well. The CPE needed will include single and multiline digital telephone sets, terminal adaptors and computers.

U.S. West, headquartered in Englewood, Colo., has six trials scheduled. Five ISDN switches will involve the 2B+D basic rate interface; one will use a GTE Omni PBX to provide 23B+D service. The timing of the trials depends, in part, on the availability of ISDN equipment. "There's not much right now," complains Joseph W. Miller III, director ISDN technical development at U.S. West Bell Services in Denver. He expects that communication equipment vendors will not have broad ISDN product lines until mid-1988. What they are offering today are prototypes and interim solutions.

One upcoming U.S. West ISDN trial may turn into a showcase of prototypes. The RHC's Mountain Bell next March will begin an ISDN trial providing ISDN-type services to Intel's Chandler, Ariz., facility. Interestingly, all of the equipment — both the 5ESS switch and the terminal equipment — will be provided by AT&T. The terminal equipment such as telephones, and integrated voice and data terminals, however, will only be on loan. "We don't really have the option to buy it," says Bolaria, Intel's ISDN product manager. Instead, after the trial the equipment will go back to AT&T labs where, Bolaria assumes, any redesign changes will take place.

Although not considered an ISDN trial switch, Nynex and Northern Telecom's joint venture, Intellihub, is a private network service that will offer business customers a great deal of ISDN-like functionality — including integrated voice and data, customer control and an all digital network. "We picture Intellihub as fitting in as an introduction to the capabilities of an intelligent network," explains John Casey, assistant director of strategic technology planning at Nynex.

In addition, Nynex has scheduled several true ISDN trials using the Siemens EWSD switch, which will be configured for ISDN by the time the trials commence. Nynex views such trials as a marketing tool to demonstrate capabilities of ISDN and to test customer interest. "Our trials actually differ somewhat from other regions," Casey says, noting that Nynex will be testing 23B+D as well as 2B+D services. "We're saying primary rate interface is equally important to basic rate interface. One is no more important than the other."

Nynex, like most other RHCs, has an open mind toward ISDN. "If we cannot deliver ISDN — 2B+D interface particularly — to be cost competitive with what customers can purchase today, we don't think ISDN will take off," says Casey. "The market will be driven by our pricing and ability to provide capabilities." □

CASE in point: New market spawns instrument changes

As the instrument companies get into software engineering, they are restructuring their traditional markets

By David Card

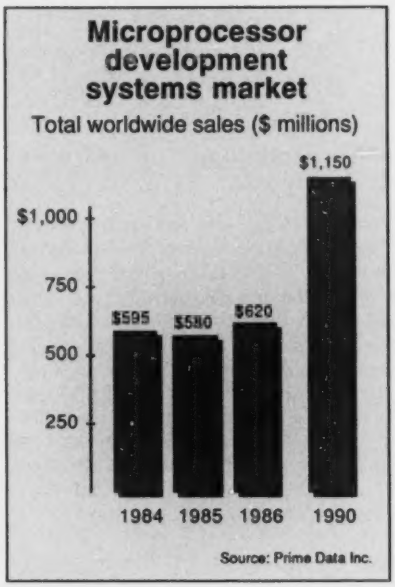
As instrument suppliers move into computer-aided engineering and software design, they are being forced to plug their tools into personal computers and workstations. This process is shaking up once-sturdy markets such as microprocessor development systems and logic analyzers. In the meantime innovative start-ups in all of these markets have shocked some of the old-timers, who are responding by cutting deals rather than trying to squash the little guys.

The development systems business "is increasingly becoming a CASE [computer-aided software engineering] business," says David Dayton, general manager of Hewlett-Packard Co.'s Logic Systems Division. HP has switched its system, which is used to develop embedded software, from a dedicated computer to an add-on box for its workstation. For application software, HP's Colorado Springs-based division has gone to start-up Cadre Technologies Inc. for tools to regulate the software-writing process.

Both HP and archrival Tektronix Inc. now bill development systems as a subset of CASE, which in turn is subsumed under the umbrella of CAE (computer-aided engineering).

Traditionally, microprocessor development systems were dedicated computers sold by the same companies that made the chips. An engineer would plug into a prototype system by replacing the system's controlling microprocessor with an emulator that aped the chip's behavior. He would then use this arrangement to integrate and debug embedded software. Intel Corp. pioneered the development system/emulator field over 10 years ago.

The market for development systems will grow 7% this year to $620 million in sales, forecasts San Jose, Calif., market research firm Prime Data Inc. President Galen Wampler says that unit sales are up, but as suppliers unbundle their systems and allow them to run on general purpose computers, prices are coming down. The end result is sluggish revenue. In 1985, Prime Data ranked Intel No. 1, with HP a distant second, Tek a more distant third and all other suppliers under $30 million in sales.



The traditional development system is dying and the newer PC plug-in version is sick, says James Huffman, engineering manager for Motorola Inc.'s Development Systems operation in Phoenix. The reason: Speed kills, he maintains. Motorola's latest microprocessor, the 68020, runs at a blistering 25 megahertz, too fast for accurate emulation via a cabled-in system, Huffman says.

"We have a much larger charter than just building emulators," Huffman says. "We've set out to put ourselves out of business." By this he means Motorola's job is first, foremost and always to sell chips — not emulators and development systems. Motorola's next microcontroller chip, still open. "CASE is growing in terms of importance," Reid says, and he does not believe any one company can do the whole job. Partnerships are the way to go. Reid says that he can even conceive of reselling emulators to HP or Tek, although he admits this may be "Intel arrogance creeping in."

More likely partners would be companies like Intergraph Corp. (newly into CAE) and Cadre, Reid says. "But we don't want joint marketing arrangements where it is just a quilting due out in 1988, will have emulator features designed into the chip itself to eliminate most of the cabling hurdle, Huffman says. Motorola is also looking into trying out this technique in its application-specific integrated circuits (ASICs).

Huffman's charter, to promote the sale of chips, has always plagued Motorola's sales of its own development system and emulator. The company encourages competing emulator vendors. For instance, to help get new chips going, Motorola has aided potential competitors' design emulators for the chips by building special versions of the chips with easier accessibility, and passing them on to the emulator companies, Huffman says. "We hope that will help us in the long run," he says, "but in the short term it looks like it hurts." He hints that this philosophy is moving Motorola toward offering CASE tools.

In contrast, Intel has always taken its development system business at face value, competing hard for sales. Intel builds a different custom chip into each of its emulators. The company is not above designing catches into its chips to prevent easy emulation, according to competitors.

This gives Intel the best match on its emulators, claims Gordon Reid, marketing manager of Intel's Development Systems group in Hillsboro, Ore. Reid says that the possibility of Intel selling its emulators to other systems development companies is

society," he says, "the partners have to add some value." Evidently the year-old partnership between Intel and CAE supplier Daisy Systems Corp. had too much stitching going on — it still exists but neither side is thrilled with the revenue.

More teaming up

In the general-purpose development system world, suppliers are rushing to add emulators for the latest hot-selling chips. HP's Dayton says his customers are asking that he add Motorola 68020 emulation, followed by an engine-control chip from Intel and a digital signal processor by Texas Instruments Inc. He sees no slacking off in new designs for older 8-bit chips, citing the ubiquitous Z80 as an example. HP must have been too busy moving its very successful development system (15,000 installed) over to its CAE workstation — it still does not offer a 68020 emulator.

Tektronix, like HP, is busy positioning CASE and development systems under the grand heading of CAE. Richard Lemke says that he was recently named president of Tek's CAE Systems Division to tie in instruments, including development systems, to CAE. The primary focus for Tek is hardware design, Lemke says, "but there is no question that we're concerned" about CASE. Although he points out that Tek's CASE staff works alongside its instrument people in the company's Beaverton, Ore., plant, there are signs that the mortar of Tek's united front has not fully dried.

Tek has licensed some software tools, but grows most of its CASE at home. Likewise, Tek has always made development systems, including emulators. Until recently that is. "The margins are highest in the front end," says William David Sharon, marketing manager for Tek's CASE tools. "As you move more toward the traditional emulators, you get more hardware manufacturing costs." Tek recently announced a 68020 emulator, but went to Applied Microsystems Corp. for the hardware to plug into a Motorola microcontroller.

Applied's vice president for business development, Richard Jensen, figures Tek is keeping emulators for the most popular chips in-house, and farming out the rest. His Redmond, Washington-based company was first out of the gate with a 68020 emulator, and ideally Applied would have liked to supply Tek with it as well. However, Jensen is happy with the Tek business and he estimates that the tie will generate $3 million over the next two years. Applied grew nearly 40% this year over last year's $12.8 million in sales.

Jensen counters Prime Data's development system sales estimates, claiming the market will shrink this year. He still thinks Applied is well-positioned at the high end, running off all of the big names in workstations as well as the IBM PC AT, and does not worry about Motorola's built-in emulation putting him out of business. "You can't embed an entire emulator into a chip because of the space it would take up on the silicon," he claims. In fact, the functions that he thinks Motorola would embed were ones that Applied had trouble plugging into, so it would only help. Motorola was an alpha-test site for Applied's latest emulator, and Jensen thinks the cooperation will continue.

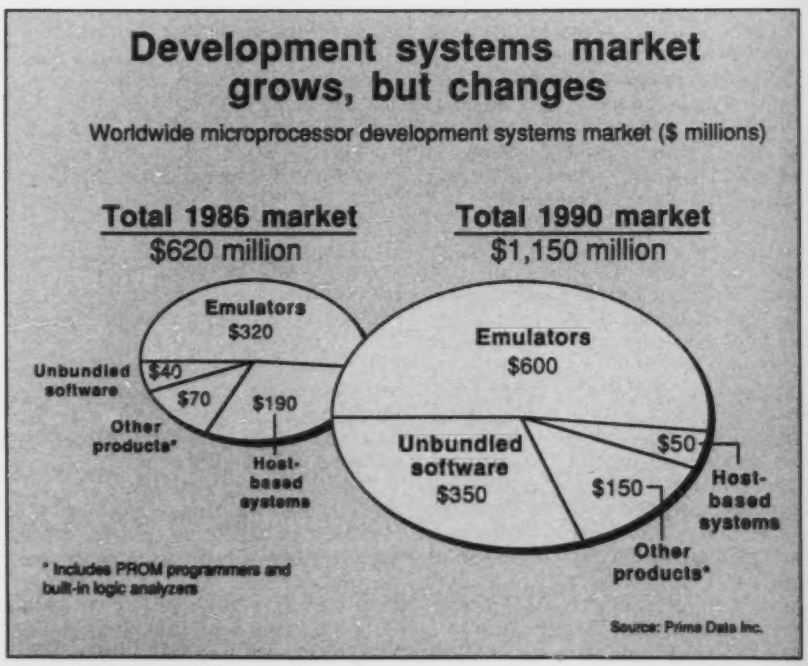
> A CASE company either has to be a start-up that can take risks, or a company big enough to throw resources at the effort

Such cooperation is critical. "In order to play in CASE, you have to be a start-up or an elephant," Jensen says. "A middle-sized company like us would get our lunch eaten alone." Because the market is so new, a CASE company either has to be a start-up that can take risks, or a company big enough to throw resources at the effort, he says.

Jensen gets no argument from $8 million Nastec Corp., based in Southfield, Mich. Vice president Albert Connor claims Nastec coined the term CASE back in 1982, but was in the job of "missionary sales," or trying to explain the market to potential customers, before the big guys legitimized it.

Nastec was doing some work for RCA Corp. last year, but RCA wanted hardware other than Nastec's Convergent Technologies Inc. computer. Connor got some specifications from RCA and took them to Digital Equipment Corp., whose VAX minis are an RCA mainstay. The joint DEC/Nastec team beat out 16 other bidders, Connor claims, for a $100,000 contract. But this money is peanuts compared to the potential RCA business, Connors says.

Nastec has since joined DEC's Cooperative Marketing Program, so DEC salesmen can recommend Nastec software. Tek, which Connor claims did not make the final cut at RCA, has signed an even tighter agreement with DEC — its CASE unit belongs to what DEC calls the Systems Cooperative Marketing Program, which allows some overlapping sales. □



Overcapacity in the U.S. capacitor industry

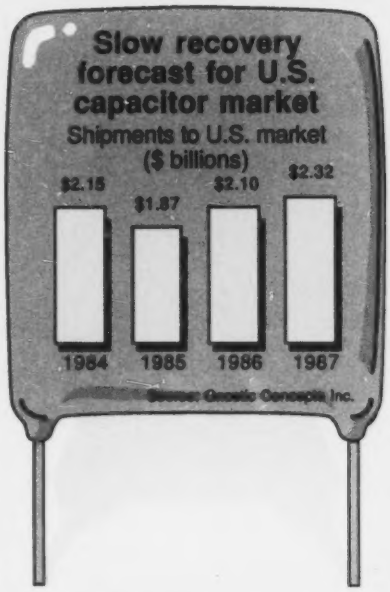
Debate rages over prospects for 1987. Will new foreign ventures in the U.S. generate new business?

By Alden M. Hayashi

Last June, Kyocera Corp. of Kyoto, Japan, officially opened a capacitor manufacturing plant in Vancouver, Wash. At a cost of $30 million, the facility will eventually be manufacturing 300 million capacitors a month. With the capacitor industry in the throes of a major recession, Kyocera's investment strategy has been questioned by some. Kyocera executives, however, claim a strong market next year will busy the new factory. "The worst is over. Next year we're going to see some real growth," predicts Michael Drotar, a product manager for Kyocera.

Others concur. Last year, the U.S. capacitor market fell 13%, from $2.15 billion in 1984 to $1.87 billion, according to Gnostic Concepts, a San Mateo, Calif., market research firm. This year won't be as disastrous, says Robert A. Patrick, vice president of marketing and sales for Mallory Capacitor Co. of Indianapolis. "We expect 1986 U.S. capacitor shipments to be flat [0% growth] to down 5%," he says. Next year will be much better, says Patrick: "1987 U.S. capacitor shipments are expected to grow 10% to 12%." Charles E. Volpe, general manager for Kemet of Union Carbide Corp., is also bullish. "I'm fairly optimistic about '87. I see some health coming back," he says. Adds Arch Martin, a marketing manager for AVX Corp. of Great Neck, N.Y.: "I see next year as being pretty good."

But some in the industry are not so optimistic. "There is a possibility for flat growth in '87. It's not a probability, but it *is* a possibility," says Donald McGuinness, executive vice president in charge of passive components for Sprague Electric Co., headquartered in Lexington, Mass. McGuinness' cautiousness comes from experience. "I've been in this business for 27 years and this is the longest down market



The industry needs a strong 1987 to correct a serious overcapacity problem

ever," he recalls. Adds George Stuart, product manager of industrial electronic capacitors for General Electric Co., "We're looking at next year as a very, very tough year, as if this year wasn't tough enough." GE sells capacitors in the high-voltage utility, air conditioning and lighting and industrial markets. "We are anticipating those markets to be flat at best and possibly down in '87," says Stuart.

What a mess

Unfortunately, the industry needs a strong 1987 to correct a serious overcapacity problem. As with its semiconductor brethren, capacitor vendors also increased their production capacity in 1983-1984 as the market, at that time, surged. But, from late 1984 on, the market soured and manufacturers were stuck with excess plant capacity. "It was just a mess," remembers Kyocera's Drota. At present, U.S. plants are still only operating at around 65% to 70% of capacity, estimates Sprague's McGuinness. Says Kemet's Volpe: "There's certainly still a lot of excess capacity left in the industry."

Emmitt Graham, an analyst with Gnostic, expects the overcapacity problem to continue through at least late next year. "Particularly in multilayer ceramic (MLC) chip capacitors, capacity will continue to lead demand. The Japanese are adding capacity at a substantial rate," says Graham.

Capacitor vendors cite the same reasons for their overcapacity problem as their semiconductor counterparts do: customer overbookings in 1983-84 and the subsequent malaise of the computer industry. Indeed, the computer industry accounted for just 16% of all U.S. factory sales of capacitors in 1985, down from 21% in 1984, says McGuinness.

Capacitor vendors are counting on an expected recovery in the computer industry to help bolster capacitor sales next year. In fact, despite its recent sluggishness, the computer industry, along with the telecommunication industry, will be the end-user industries with the highest growth, claims McGuinness. Adds Mallory's Patrick: "In 1987, we expect to see the strongest growth in the communication and computer equipment markets as the result of expected recovery in capital investment for this type of equipment." And customers have since burned off their excess inventories, says Gnostic's Graham. "The inventory situation is well under control now," he claims.

Other factors might also help.

Kemet's Volpe says he sees one positive trend: systems companies (customers of capacitors) doing more manufacturing in the United States. "We still have customers moving offshore but not as much as we did last year. And some of them are starting to come back home. The trend toward offshore manufacturing hasn't stopped but it has slowed down," says Volpe.

In addition to U.S. firms, foreign companies are also turning to the United States for manufacturing. The Japanese, in particular, seem eager to expand their manufacturing in the United States, due in part to the recent U.S.-Japan trade friction and the effects of the high-valued yen. Last September, Matsushita Electric Industrial Co. Ltd., headquartered in Japan, began manufacturing televisions in its new Vancouver, Wash., facility.

Onshore versus off

Some U.S. capacitor vendors, however, question whether the increase in foreign company manufacturing in the United States will lead to more business for U.S. companies. "I would be very much surprised if we went to call on a Japanese company in the U.S., and they were receptive," says Kemet's Volpe. Adds Sprague's McGuinness: "We're not counting on any extra business." McGuinness explains that foreign companies will probably buy parts from their fellow countryman suppliers. He recalls a similar situation with his company back in the 1960s when IBM expanded its operations in Europe. "Everywhere IBM went, we just put up a plant right next to them," remembers McGuinness.

Because of this trend of increased U.S. manufacturing by Japanese companies, Kyocera's Drotar says: "It [our plan to open a capacitor plant in the U.S.] is unfolding and blossoming like a flower." Kyocera's ambitious goal is to own 30% of the U.S. ceramic capacitor market by 1990. The company currently controls 10% of the market, according to Drotar.

Other foreign companies may follow Kyocera's lead. "We see the U.S. as our highest opportunity growth market for the future," says John Davidson, president of Rifa Inc., a wholly owned subsidiary of L.M. Ericsson, headquartered in Sweden. Davidson says Rifa has just begun a more aggressive sales and marketing program in the United States. He is planning for Rifa's sales to grow annually by 30%.

Davidson now has a better chance of meeting his goal because prices in the industry have recently begun to stabilize. According to Kyocera's Drotar, prices of ceramic capacitors fell 30% from 1984 to 1985. But from 1985 to 1986, prices only dropped 10%. "There has been a firming of prices," agrees Kemet's Volpe, who adds that prices for MLC and tantalum capacitors have stopped falling. And some companies have even begun to raise prices. Sprague recently increased the prices for its wet foil and tantalum capacitors as well as for

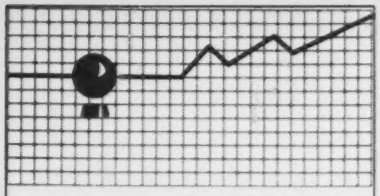
A maturer market strategy

Sprague Electric Co., the leader in the U.S. capacitor market, has undergone a fundamental change in philosophy. Owned by Penn Central Corp., Sprague has adopted a more mature strategy to fit the now mature capacitor industry.

Back in the 1970s, Sprague's philosophy was: "Don't be late with an investment," recalls Donald McGuinness, executive vice president in charge of passive components. Thus the company hurriedly entered into new markets and expanded in existing ones. But now that the capacitor industry has matured, Sprague is now judiciously targeting return on investment and profitability as the key criteria for investment decisions.

"We're not saying [anymore]: 'Throw money there, we've got to get the lead.' But what we are now saying is: 'Let's pick the places where we can be No. 1. Let's not chase after market share for the sake of market share,'" says McGuinness.

Sprague is not the only company with this new attitude. "Everyone in the industry is asking: 'Do I really want more market share?,'" says Arch Martin, marketing manager for AVX Corp. of Great Neck, N.Y. Adds McGuinness: "If you have a big market share and you're not making any money, that's pretty stupid." □



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some of its aluminum and film capacitor line, according to McGuinness.

Reduced lead times

Lead times have also stabilized. According to AVX's Martin, lead times have remained constant for the past year. Vendors are now working on reducing their lead times, not through added capacity, but through closer relationships with customers. Through the installation of programs such as just-in-time (JIT) delivery, vendors are hoping to slash lead times to just a few weeks. "Customers aren't going to give you big guaranteed orders anymore if your lead times are too long," says Sprague's McGuinness. Kemet's Volpe sees a hidden blessing in programs such as JIT delivery. As U.S. customers install JIT delivery programs, they will tend to favor U.S. capacitor manufacturers as opposed to foreign ones, reasons Volpe.

This favoritism will play an important role as customers begin to limit the number of their suppliers. "Every one of our major customers is on a reduction-of-supplier program. If a customer had four suppliers before, he may have just one or two now," says Volpe. Adds Sprague's McGuinness: "With a lot of customers, they just want one supplier."

Another industry trend is the evolution toward surface-mounted capacitors. "The move to surface mount will dominate the industry in the coming years," predicts Kemet's Volpe. Some vendors are already experiencing the change. "We're starting to get the real inquiries and customers are now placing large orders of 50 million [units] instead of 5,000," says Kyocera's Drotar. According to him, "All the major disk drive manufacturers have surface mount programs in effect and the computer industry is finally going surface mount." Because of this, the market for surface-mounted ceramic capacitors will grow five times as fast as the overall ceramic capacitor market, claims Drotar.

The surface mount evolution will not benefit all types of capacitors equally. "Mono[lithic ceramic] and tantalum capacitors will be the big winners because it's easier to convert them," says Sprague's McGuinness. According to him, wet electrolyte capacitors such as aluminum ones will be very difficult to convert to surface mount.

If McGuinness is right, ceramic and tantalum capacitors could gain further share in the overall market. Already, both types of capacitors control 65% of the market on a dollar basis, up from 47% more than a decade ago, according to the Electronic Industries Association of Washington D.C. In contrast, the market share for aluminum capacitors has fallen from 22% to 12% during the same time period.

What is a capacitor

A capacitor is an electronic component that stores electricity through the use of a dielectric, a material that is a poor conductor of electricity. When placed in a circuit, the capacitor's dielectric slows the flow of electricity and stores the excess. Generally, capacitors are classified by the type of dielectric used. Ceramic, tantalum, aluminum and film are popular materials used as dielectrics. □

But vendors of the other types of capacitors are not quitting. Using a proprietory pre-aging foil process, West German giant Siemens AG says it will begin manufacturing chip film capacitors in surface mount form this year. Volume production will commence in 1987. According to Rudy Strasser, capacitor product marketing manager for Siemens Components Inc., a subsidiary of Siemens AG, about a quarter of all chip film capacitors will be surface mounted within the next five years. Currently, virtually none of these capacitors are surface mounted.

But still, "mono[lithic ceramic capacitor] chips are the fastest growing type of capacitor," claims McGuinness. According to him, the market for this type of capacitor will have a long-term growth in excess of 10% next year. And the market for tantalum capacitors will grow by 7% to 8% on a long-term basis, he adds. On the other hand, the market for aluminum, film and other types of capacitors will grow no more than 5%, claims McGuinness. □

Last month, Union Carbide announced it would sell Kemet (the No. 2 U.S. capacitor vendor). Sprague (the No. 1 U.S. capacitor vendor), among several other capacitor manufacturers, was reportedly interested in the purchase although Union Carbide had not yet issued any offering letters.

Japanese electronics: Alive in '85, mixed in '86

The Japanese electronics industry saw earnings take a nosedive last year, and that was before the rise of the yen

By Paula Doe

Japan's big producers maintained strong growth in electronics sales in 1985, but they paid for it with sharply reduced earnings. Electronics sales at the top 15 Japanese companies were up 22%, more than twice the 10% increase at the top 15 U.S. electronics producers. But at the same time, Japanese earnings were correspondingly down 20%, more than twice the 7.6% drop at their U.S. counterparts.

Unconcerned with racking up short-term gains for shareholders, Japanese companies seldom show fat profits. But 1985 earnings were grim, even by Japanese standards. Unconsolidated earnings at the big five Japanese computer and semiconductor makers — Fujitsu Ltd., NEC Corp., Hitachi Ltd., Toshiba Corp. and Mitsubishi Electric Corp. — dropped an average 46%. (Unconsolidated refers to financial figures for the parent company only; it does not refer to earnings from subsidiaries or joint ventures in which the parent company holds a controlling interest.) Total consolidated earnings for the top 15 Japanese electronics producers, including subsidiaries, were down 20.1%. Margins for the top 15 were cut in half, as profits fell from 6% to 3% of sales. Return on equity slipped 24%, to an average 7.9%. Return on investment was off 20%, to 6.8%.

Yet things could have been worse in the Japanese electronics business — and assuredly, they will be before the year is out. Results for 1985 were cushioned at most Japanese companies by a fat first half. It wasn't until the second half of the year that the electronics slump finally hit Japan, and the yen began its climb against the dollar. The Japanese managed to protect their exports through the end of the year, despite the expensive yen. Exports at the big electronics producers had fallen less than 2% on average (unconsolidated) by the end of fiscal 1985, which ended in March 1986 for most Japanese companies.

Though the high yen devastated Japanese producers' profits, it makes all dollar-denominated figures from Japan look great. The 27% rise in the yen between March 1985 and March 1986 makes all the Japanese companies' dollar results look 27% better, both for revenue and profits. In dollars, the top 15 Japanese electronics companies appear to have a respectable 8.5% increase in earnings on 33% growth in revenue.

At 180 yen to the dollar (the official exchange rate, as of March 1986, prior to last summer's slide to 150 yen to the dollar), the big Japanese electronics companies look even bigger. Six Japanese companies now have electronics revenue of $7 billion or more. Only three did in 1984. And five of the top eight companies are now Japanese on a combined ranking of U.S. and Japanese companies' electronics sales. No Japanese company, of course, approaches $50 billion IBM, but Matsushita Electric Industrial Co., at $17.9 billion in electronics sales, is now bigger than AT&T and all other U.S. electronics companies. Only IBM, AT&T and General Motors

Top Japanese electronics companies

Company	Electronics sales ($ million) 1985	Electronics sales ($ million) 1984	Total sales ($ million) 1985	Total sales ($ million) 1984	Net income ($ million) 1985	Net income ($ million) 1984
Matsushita	$17,889	$14,518	$28,071	$19,356	$1,369	$976
NEC	12,361	9,258	12,611	9,258	261	275
Hitachi	12,222	9,865	27,836	20,553	835	861
Toshiba	8,889	6,031	18,739	13,706	330	353
Fujitsu [1]	8,733	6,375	9,444	6,375	238	363
Sony	7,333	4,973	7,995	5,236	406	291
Sanyo Electric	4,767	3,563	8,433	5,904	200	180
Mitsubishi	4,167	3,345	11,078	8,306	186	192
Sharp [1]	4,150	4,264	6,667	4,763	194	163
Canon	3,450	2,216	5,311	3,388	206	143
Ricoh	2,838	1,914	3,300	2,229	83	69
Oki [1]	2,272	1,673	2,317	1,706	6	37
Tokyo Sanyo [1,2]	2,133	1,380	3,050	1,971	83	73
Alps [1]	1,900	1,461	2,000	1,539	50	73
Pioneer	1,816	1,253	1,894	1,306	-17	33

[1] Consolidation by Japanese accounting conventions, which differ slightly from U.S. Securities and Exchange Commission rules used by other companies.
[2] Sanyo Electric Company Ltd. owned 20% of Tokyo Sanyo Electric Company Ltd. for the fiscal year ending November 1985.

Corp. — thanks to its acquisition of Hughes Aircraft Co. — are still bigger than at least some of the big Japanese companies Matsushita, Hitachi, NEC, Toshiba and Fujitsu.

The strong yen also made strong showings by particular companies look even stronger. Toshiba leaped from No. 13 last year to No. 7 this year on the combined rankings, Sony from No. 16 to No. 11.

Japan's fabled productivity, as measured by dollar sales per employee, gets an artificial 27% boost as well. At 180 yen to the dollar, the top 15 Japanese electronics companies got two times the sales out of each worker as did the U.S. top 15, and 1.6 times the sales per employee average for all the 1985 ELECTRONIC BUSINESS 200. If the exchange rate had remained at last year's 245 yen to the dollar, however, the Japanese would have only had a 47% advantage over the U.S. top 15, and only a 16% edge over the 200.

ELECTRONIC BUSINESS collects the top Japanese electronics companies' financial results from Japanese financial reports, available long before most Japanese companies release their English language, U.S.-style annual report for the year. The companies' consolidated revenue and earnings, and all parent-company-only figures come from Japanese company reports, press releases and the directory *Kaisha Shikiho*, published quarterly by *Toyo Keizai Shuppansha*. Consolidated electronics sales and productivity figures are calculated by ELECTRONIC BUSINESS with the help of Nomura Securities International Inc., the New York branch of a leading Japanese investment house.

Though the data supplied strictly by Japanese sources is more timely, most of it is for the parent company only, as required by Japanese law and accounting conventions. Subsidiaries, even if 50% or more controlled by the parent, report as separate companies in Japan. Detailed unconsolidated figures are reported to the Ministry of

Composite performance: Japan vs. U.S. electronics companies

	Japan top 15	U.S. top 15	U.S. top 200
Electronics revenue for 1985 ($ billions)	$94.8	$148.8	$267.8
Change from previous year	22%*	+10%	+4.5%
Total revenue for 1985 ($ billions)	$148.7	$284.9	$797.8
Change from previous year	3.5%*	+7%	+2.7%
Net income for 1985 ($ billions)	$4.4	$17.2	$35.4
Change from previous year	-20.1%*	-7.6%	-23.7%
Net income as a percentage of sales	3%	6%	4%
Return on equity	7.9%	9.5%	11.8%
Return on investment	6.8%	7.7%	8.7%
Revenue per employee	$173,300	$87,600	$110,800
Net income per employee	$4,700	$4,500	$5,000

* Percentage change in yen

Source: ELECTRONIC BUSINESS, Nomura Securities International Inc.

JAPANESE COMPANIES maintained sales growth by squeezing profits. In the United States, the trend was the same, but less extensive

Net income as a percentage of sales 1985	Net income as a percentage of sales 1984	Return on equity[3]	Return on investment[3]	Sales per employee	Net income per employee	Parent company only: Sales ($ million)	Parent company only: Net income ($ million)	Parent company only: Exports	Fiscal year end
5%	8%	10%	10%	$209,500	$10,200	$19,023	$620	37%	11/85
2%	3%	11%	7%	131,600	2,700	10,947	295	32%	3/86
3%	4%	11%	9%	169,600	5,100	16,686	489	33%	3/86
2%	3%	9%	7%	156,200	2,800	13,998	300	29%	3/86
3%	6%	6%	4%	117,000[4]	2,900[4]	7,942	164	22%	3/86
5%	6%	11%	11%	178,000	9,000	5,952	272	71%	10/85
2%	3%	8%	8%	331,600	7,900	5,822	83	61%	11/85
2%	2%	6%	5%	155,000	2,600	10,117	136	27%	3/86
3%	3%	10%	8%	231,500[3]	8,400[3]	5,307	193	60%	3/86
4%	4%	9%	8%	161,000[4]	6,200[4]	3,194	133	75%	12/85
3%	3%	7%	7%	132,000	3,300	2,722	67	38%	3/86
2%	2%	2%	1%	125,000[4]	300[4]	2,011	11	28%	3/86
3%	4%	9%	9%	212,000[4]	5,800[4]	2,978	83	48%	11/85
3%	5%	8%	7%	160,000[4]	4,000[4]	1,578	50	24%	3/86
-1%	3%	1%	1%	128,800	-900	1,444	11	43%	9/85

[3] Parent company only.
[4] Consolidated employees estimated from 1984 consolidated figures and 1985 parent company only figures.

Sources: ELECTRONIC BUSINESS, Nomura Securities International Inc.

Finance and released to the public within three months of the end of the fiscal year, which ends in March for most Japanese companies. But consolidated financial figures, which combine results from the parent company and all subsidiaries in which it owns controlling interest, trickle out more slowly.

Most major companies now report consolidated sales and earnings totals when they release their Japanese parent-company-only results, but further details do not come out until the publication of the English language annual report. The Japanese companies listed on one of the U.S. stock exchanges get these reports out reasonably promptly, as U.S. law requires, but the majority of even the big Japanese companies take at least six months after the end of the fiscal year to get out these U.S.-style numbers. And some that don't sell stock in the United States never put together U.S.-style detailed consolidated financial reports at all. □

Japanese computer firms had few complaints last year

Computer sales showed double-digit growth in 1985, good news for Japanese subsidiaries of U.S. companies

The following article is based wholly on a previously untranslated article about the Japanese computer industry which appeared in Computopia *magazine in August.* Computopia *is published in Tokyo by Computer Age Company Ltd.*

The Japanese computer market continues to perk right along at its steady double-digit growth rate. But last year, for a change, American companies were the ones who made money.

The nine major computer companies in Japan averaged 14% sales growth in 1985. Forecast for 1986: about the same, as steady growth in the Japanese market counterbalances a drop in exports.

The expensive yen gave U.S. computer companies a boost in Japan in 1985. The five major Japanese computer makers, Fujitsu Ltd., NEC Corp., Hitachi Ltd., Toshiba Corp. and Mitsubishi Electric Corp., saw their unconsolidated pretax profit plummet 46%, on average, for the year. But the big four Japanese subsidiaries of U.S. computer companies, IBM Japan, Nippon Univac Kaisha Ltd., NCR Japan Ltd. and Burroughs (Japan), increased their pretax earnings an average 15%.

IBM Japan earned pretax profits of a healthy 15% of sales, in sharp contrast to 3% at Fujitsu and 5% at NEC. But the Japanese companies continued to sell more computers in Japan than IBM. Fujitsu maintained its dominance, with computer sales in Japan of $4.7 billion (¥180=$1) in 1985, compared to $3.9 billion for NEC, and $3.7 billion for IBM. But if exports are included in the sales totals, IBM Japan sold more computers overall ($5.1 billion) than NEC ($4.5 billion). Slightly faster growth at Big Blue's Japanese subsidiary meant it gained a little on Fujitsu for total sales, but still remained some 12% behind its rival's $5.7 billion.

Last year's Japanese computer market was spurred by healthy demand for the new generation of giant mainframes, IBM's 3090 Sierra and the Japanese computer makers' competing products. Fujitsu says it received 261 orders for its big VP series mainframe in 1985, twice the number as the year before, for 60% more revenue. Hitachi has orders for 112 of its giant mainframe, while NEC has orders for 94.

The personal computer and office automation market continued strong. NEC continued to dominate the personal computer market, with sales up 19% to $1.3 billion.

Fastest growing of the major computer makers last year was Toshiba. That company's 27% spurt in computer sales came largely from strong growth in sales of peripherals (up 40%) and word processors.

At the other end of the spectrum, Mitsubishi Electric's plummeting exports resulted in no growth in its computer sales at all. A prime factor: A patent dispute with Tandon Corp. over disk drives.

In the broader category of office automation equipment, which includes computers as well as such other electronic office equipment as copiers, facsimile machines and word processors, U.S. companies in Japan had

Top Japanese computer makers

Company	Computer division sales ($ millions)	Growth rate 1985/1984	Exports ($ millions)	Exports as a percentage of total sales	Projected 1986 sales ($ millions)	Projected growth rate 1986/1985
Fujitsu	$5,711.1	+17.6%	$1,012.8	17.7%	$6,500.0	+13.8%
IBM Japan	5,080.6	+19.0%	1,421.7	28.0%	N/A	+15.0%
NEC	4,516.7	+23.0%	644.4	14.3%	5,277.8	+17.0%
Hitachi	3,333.3	+12.8%	566.7	17.0%	3,888.9	+16.7%
Toshiba	1,627.8	+27.0%	288.9	17.7%	1,944.4	+19.4%
Mitsubishi	916.7	0.0%	165.0	18.0%	988.9	+8.0%
Nippon	750.6	+11.2%	0.0	0.0%	833.3	+11.0%
NCR Japan	567.2	+13.6%	102.2	18.1%	633.3	+11.7%
Burroughs	453.9	+1.3%	45.6	10.0%	544.4	+20.0%

Source: Computopia magazine

Top Japanese computer and office automation equipment vendors

Company	Information processing equipment sales ($ millions)	Total sales ($ millions)	Percentage change from 1984	Pretax profit ($ millions)	Percentage change from 1984	Fiscal year ends
Hitachi	$7,863.90	$16,685.0	-0.7%	$877.80	-38.3%	3/86
Fujitsu	5,711.1	7,941.1	+10.6%	210.0	-67.8%	3/86
IBM Japan	5,080.6	5,080.6	+18.9%	748.3	+31.9%	12/85
NEC	4,605.6	10,946.7	+4.0%	525.0	-25.0%	3/86
Sharp	3,509.4	5,306.7	+5.0%	357.2	+1.4%	3/86
Matsushita	2,655.0	19,022.8	+5.0%	279.4	+6.5%	11/85
Mitsubishi Electric	2,601.1	10,116.1	-2.1%	223.9	-53.0%	3/86
Ricoh	2,566.7	2,722.8	+8.5%	142.2	-12.0%	3/86
Fuji Xerox	1,928.9	1,928.9	+21.0%	185.0	+6.0%	11/85
Canon	1,668.9	3,196.1	+18.5%	236.1	+9.8%	12/85
Toshiba	1,627.8	13,997.2	-0.2%	446.7	-45.0%	3/86
Oki	1,095.6	2,008.9	-0.1%	7.8	-92.0%	3/86
Sanyo Electric	925.0	5,820.0	+5.6%	324.4	+4.8%	11/85
Nippon Univac	750.6	750.6	+11.0%	27.8	-4.0%	6/85
Casio Computer	746.7	1,312.2	+12.0%	71.7	-21.0%	3/86
Seiko Epson	584.4	1,461.1	+49.5%	N/A	N/A	3/86
Commodore Japan	583.3	583.3	+5.2%	N/A	N/A	6/86
Burroughs	453.9	453.9	+1.0%	40.6	+10.0%	11/85
NCR Japan	445.6	567.2	+13.6%	101.7	+21.0%	11/85
Tokyo Electric	363.9	856.7	-13.0%	46.7	-31.0%	3/86
Panafacom	303.9	303.9	+24.0%	12.8	N/A	3/86
DEC Japan	243.3	243.3	+42.0%	13.9	N/A	6/86
Yokogawa Hewlett-Packard	232.8	582.2	+17.0%	N/A	N/A	10/85
Nihon Business Computer	166.7	166.7	+36.0%	N/A	N/A	3/86
Seikosha	158.3	527.8	+2.0%	N/A	N/A	3/86
Japan Data General	141.7	141.7	+79.0%	44.4	-27.0%	10/85
Uchida Yoko	123.9	562.2	+5.0%	18.3	+17.8%	7/85
Sony	118.9	5,951.7	+17.0%	505.6	+13.0%	10/85
Olivetti Japan	117.8	130.6	+11.9%	N/A	N/A	12/85
Sord	65.6	65.6	-37.0%	-10.0	N/A	3/86

Nonconsolidated results. For parent company or specified subsidiary only

Source: *Computopia* magazine

an encouraging year — the fastest growing companies all sold U.S. products. Nippon Data General, Japan Business Computer and Yokogawa Hewlett-Packard outpaced the competition, thanks to the advantageous exchange rate and the right products.

OA for the U.S.A.

Fastest growth of the top 30 office automation (OA) companies was achieved by Nippon Data General. The company saw an impressive 79% increase in revenue. But like a true Japanese company, the U.S. subsidiary suffered a 27% drop in profits, as its exports of the portable Data General/One computer to the United States got walloped by the soaring yen.

Sales of computer and office automation equipment at Nihon Business Computer climbed 36% in 1985, due to the dealer's healthy sales of IBM equipment, particularly the IBM System 36.

Yokogawa Hewlett-Packard increased its revenue 17%, thanks to strong sales of Hewlett-Packard's Unix-based engineering workstations. The HP 9000 series and the HP 9807 did well, and the technical workstation 9300, introduced last September, was especially popular.

Seiko Epson Corp's 17% increase in sales was due to the merger of Seiko and Epson.

Worst performance honors among the office automation makers go to personal-computer maker Sord, in its first year under Toshiba's wing. Sord undertook a major revision of its product development system and wrote off inventories, resulting in a 37% drop in sales and a loss of $6.5 million.

The big Japanese computer makers remain cautiously optimistic about the rest of fiscal 1986. Though they expect exports to continue to be hurt by the high yen, they count on healthy domestic demand to result in a net 14% to 15% growth in computer sales. NEC expects its earnings to be up 12% from sales of its big ACOS System 1000 mainframes to Honeywell Inc. and Groupe Bull. Hitachi expects to increase its exports 17% in 1986, with strong sales overseas of its 5-megabyte disk drive equipment. Fujitsu, however, projects a 10% drop in exports. □

LEADTIME INDEX

Electronic component leadtimes

Percentage of respondents

ITEM	Off the shelf	1-5 weeks	6-10 weeks	11-20 weeks	21-30 weeks	Over 30 weeks	Last month's average	Average
TRANSFORMERS								
Toroidal	0	27	46	27	0	0	8.5	9.3
Pot-Core	8	33	34	25	0	0	7.3	9.6
Laminate (power)	7	20	40	33	0	0	8.9	6.6
CONNECTORS								
Military panel	0	0	75	0	0	25	13.8	13.1
Flat/Cable	22	39	30	9	0	0	4.6	4.6
Multipin circular	0	31	54	15	0	0	7.4	10.4
PC	7	33	40	20	0	0	7.1	5.8
RF/Coaxial	18	35	35	12	0	0	5.4	5.9
Socket	30	25	30	15	0	0	5.3	5.3
Terminal blocks	15	35	30	20	0	0	6.3	4.4
Edge card	10	35	45	10	0	0	5.9	7.3
Subminiature	20	13	53	7	7	0	7.3	6.4
Rack & panel	9	9	55	18	9	0	9.8	7.3
Power	8	31	38	15	8	0	8.2	6.0
PRINTED CIRCUIT BOARDS								
Single-sided	0	48	52	0	0	0	5.1	4.8
Double-sided	0	50	50	0	0	0	5.0	5.8
Multilayer	0	14	62	24	0	0	9.0	8.8
Prototype	0	83	17	0	0	0	3.0	2.9
RESISTORS								
Carbon film	56	13	19	12	0	0	3.6	3.6
Carbon composition	46	17	25	12	0	0	4.3	4.6
Metal film	42	21	33	4	0	0	3.8	3.9
Metal oxide	27	27	37	9	0	0	4.9	4.5
Wirewound	18	41	29	12	0	0	5.1	6.3
Potentiometers	12	46	27	15	0	0	5.5	6.6
Networks	18	27	41	14	0	0	6.0	7.6
FUSES	48	35	17	0	0	0	2.1	3.7
SWITCHES								
Pushbutton	14	33	34	19	0	0	6.4	5.1
Rotary	5	30	35	30	0	0	8.2	6.9
Rocker	20	30	35	15	0	0	5.8	5.9
Thumbwheel	0	42	42	16	0	0	6.8	8.3
Snap action	17	33	42	8	0	0	5.3	4.9
Momentary	7	36	43	14	0	0	6.4	4.6
Dual in-line	15	31	38	16	0	0	6.2	3.7
WIRE AND CABLE								
Coaxial	35	41	18	6	0	0	3.2	2.8
Flat ribbon	27	41	23	5	4	0	4.5	3.8
Multiconductor	35	24	29	6	6	0	5.3	3.8
Hookup	41	41	11	4	3	0	3.7	1.9
Wire wrap	43	29	21	7	0	0	3.4	3.1
Power cords	21	34	34	7	4	0	5.4	3.8
Other	22	34	22	22	0	0	6.0	7.4
POWER SUPPLIES								
Switching	6	18	41	35	0	0	9.3	9.4
Linear	14	21	43	22	0	0	7.3	8.0
CIRCUIT BREAKERS	19	38	12	31	0	0	6.8	6.8
HEAT SINKS	29	33	29	9	0	0	4.5	5.1

ITEM	Off the shelf	1-5 weeks	6-10 weeks	11-20 weeks	21-30 weeks	Over 30 weeks	Last month's average	Average
RELAYS								
General purpose	30	15	35	20	0	0	6.3	6.2
PC board	7	27	33	33	0	0	8.5	6.8
Dry reed	10	20	30	40	0	0	9.2	8.2
Mercury	10	20	40	30	0	0	8.4	10.1
Solid state	6	19	38	31	6	0	10.0	8.9
DISCRETE SEMICONDUCTORS								
Diode	34	32	20	11	3	0	4.8	4.5
Zener	23	37	20	17	3	0	5.9	5.5
Thyristor	18	18	41	17	6	0	8.0	7.1
Small signal transistor	24	19	38	14	5	0	7.0	6.7
FET, MOS	13	13	47	20	7	0	8.9	8.6
Power, bipolar	21	16	42	16	5	0	7.6	7.3
INTEGRATED CIRCUITS, DIGITAL								
CMOS	21	21	31	24	0	3	7.8	7.6
TTL	29	25	25	17	0	4	6.5	7.5
LS	29	21	29	17	0	4	6.7	7.7
INTEGRATED CIRCUITS, LINEAR								
Communication/circuit	8	15	46	31	0	0	8.9	7.7
OP amplifier	21	29	21	29	0	0	6.9	9.2
Voltage regulator	28	32	20	20	0	0	5.4	8.2
MEMORY CIRCUITS								
RAM 16K	25	31	19	25	0	0	6.1	7.1
RAM 64K	29	29	24	18	0	0	5.3	6.2
RAM 256K	25	25	31	19	0	0	6.0	7.5
ROM/PROM	20	13	40	27	0	0	7.7	8.3
EPROM	23	32	32	13	0	0	5.4	7.4
EEPROM	20	27	33	20	0	0	6.4	10.8
DISPLAYS								
Panel meters	16	15	46	23	0	0	7.7	8.3
Fluorescent	0	11	56	33	0	0	10.0	10.4
Incandescent	0	13	50	37	0	0	10.3	10.0
LED	18	30	41	11	0	0	5.6	5.6
Liquid crystal	8	23	38	31	0	0	8.5	8.3
MICROPROCESSOR ICs								
8-bit	9	48	14	19	10	0	7.6	6.9
16-bit	0	41	29	18	12	0	9.1	7.0
FUNCTION PACKAGES								
Amplifier	0	25	38	37	0	0	9.5	7.3
Converter, analog to digital	0	25	50	25	0	0	8.5	8.3
Converter, digital to analog	0	25	42	33	0	0	9.2	10.1
LINE FILTERS	0	53	12	29	0	6	8.5	7.2
CAPACITORS								
Ceramic	26	19	37	18	0	0	6.3	5.5
Ceramic monolithic	25	29	25	21	0	0	5.9	5.8
Ceramic disc	29	8	46	17	0	0	6.5	5.5
Film	17	22	44	17	0	0	6.7	4.6
Electrolytic	24	32	28	12	4	0	5.8	6.7
Tantalum	10	30	41	15	4	0	7.2	6.1
INDUCTORS	10	40	25	25	0	0	6.8	8.1

Source: *Electronics Purchasing* magazine's survey of buyers